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VOL. XXXI.



. . THE . .

# AGRICULTURAL GAZETTE

. . OF . .

# NEW SOUTH WALES.

Issued by Direction of

THE HON. W. F. DUNN, M.L.A.,

MINISTER OF AGRICULTURE.

W. H. BROWN, *Editor.*



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VOL. XXXI PART 1 JANUARY 2, 1920.

*Agricultural Gazette of New South Wales.*

# The Motor Tractor in Great Britain.*

OF the changes wrought by the war in the everyday aspects of English industrial life, none was more marked than that apparent in the pleasant places devoted to agriculture. The necessity of increased production of foodstuffs became early insistent, and the task of increasing the acreage under crops one of the utmost importance. In view of the shortage of both men and horses, the problem of suitable substitutes was an acute one. It was solved, however, as others were solved, and the innovations enabling its solution were soon employed—often most amicably—throughout the length and breadth of the country.

So soon as the situation was realised, the Ministry of Food Production purchased practically all the tractors available, irrespective of make, and in conjunction with local Agricultural War Committees throughout the country, set to work to break up the land. As most of the British factories had been converted for the manufacture of munitions, most of the tractors were imported from America.

The Government was severely handicapped in the proper working of its scheme by the scarcity of drivers and engineers, and of spare parts, as well as the unsuitability of many of the machines for the work. The agricultural implements at first in use were unsuitable, too, and much time was lost before the necessary adjustments were made and unsuitable machines discarded. It cannot therefore be a matter of surprise that the expenses were high, as the following figures indicate :—

*England*—

| | |
|---|---|
| Expenses of Department ... ... ... | £1,162,442 |
| †Recovered from farmers ... ... ... | 322,472 |
| Leaving a debit of ... ... ... ... | 839,970 |

The cost of the land ploughed equalled £4 17s. 4d. per acre on the above figures.

*Scotland*—

| | |
|---|---|
| Expenses of Department ... ... ... | £49,925 |
| †Recovered from farmers ... ... ... | 34,206 |
| Leaving a debit of ... ... ... ... | 15,718 |

The cost of the land ploughed equalled £1 19s. 5d. per acre on the above figures.

As experience with the tractors accumulated, the number of makes in use was inevitably narrowed down, only three or four being generally retained. Of these the Fordson and Titan were most largely used, and up to the present are the most popular of the types that have figured in the scheme. Concerning the effort generally, it may be said that although it was expensive, it was undoubtedly successful in achieving its prime purpose—the increase of the acreage under crops. Moreover, the scheme afforded the

*Compiled from a report by A. J. Pinn, Inspector of Agriculture, after an investigation of the working costs of farm tractors in Great Britain.

† The average charge to the farmer was £1 7s. per acre.

farmers of Great Britain an unique opportunity of studying the potentialities of radical and scientific treatment of existing conditions, with the result that many farmers have now become owners of tractors who would otherwise never have dreamt of employing any more effective medium than horse power.

Before the advent of the tractor, ploughing in Great Britain was done by teams of two horses and single-furrow ploughs, gang ploughs being little used. The employment of additional ploughmen was consequently necessary, thus adding largely to the cost. Under that method the cost of ploughing may be reckoned at 19s. and upward per acre (horses 6s. each per day, man's wages 6s. and upward per day, and 1s. for wear and tear, grease, &c.) These costs are obviously high, and tractors should have had little difficulty in effecting a saving.

Some difficulty attended the gathering of any definite figures as to the cost of ploughing by tractor when the writer approached private owners. The consumption of paraffin, petrol, oil, and grease was usually known, but no account had been taken of allowance for wear and tear. In most cases the machines were new, and there had consequently been little trouble from wear and breakages. In estimating the running cost of a tractor, therefore, the allowance that should be made for those debatable items constituted a considerable problem, but high-speed light tractors may be given a life of two years, while a 20 per cent. depreciation should be a fair estimate for low-speed heavy tractors. The cost of upkeep varies considerably, in some cases not exceeding £15 for the first year, but usually being very much in excess of that figure, especially with a high-speed engine. A safe estimate should be from 15 to 20 per cent. of the cost of the machine. The expenses for spare parts (at cost price) used on the Government tractors amounted to about 3s. per acre ploughed.

The Fordson tractor is fitted with a high-speed engine, which means greater wear and tear and greater consumption of lubricants. With this machine a good deal of the paraffin finds its way through to the base chamber and weakens the lubricating oil, hence hindering the proper oiling of the bearings, and causing speedy deterioration of the wearing parts. For this machine it is necessary that the oil chamber should be drained and a fresh supply of oil given at intervals not exceeding fifty hours. The Fordson, being a light machine, consumes less paraffin per acre than other makes of tractors that have been employed. Estimates based on figures from private owners show the average consumption for ploughing per acre for all machines as follows:—Paraffin, 4 gallons per acre; lubricating oil, ½ gallon per acre; grease, 2 oz. per acre. As petrol is only used for starting, the amount used would be scarcely worth consideration when divided over a good day's work.

The tractor mentioned usually draws a double-furrow plough, and the Titan, Mogul, Overtime, &c. a three-furrow implement. If the average ploughing is taken as a 10 in. furrow, 7 inches to 9 inches deep, the draw-bar pull on a three-furrow plough may be estimated as somewhere equivalent to that of a five-furrow plough in average soil in New South Wales wheat country, where ploughing is much shallower.

The following figures, showing cost of ploughing, are calculated principally on the work of the type of tractor with a low-speed engine (which is the more reliable) at the least possible expense. The plant is put down at £370 for the cost of the tractor, and £65 for the plough. The prices are English prices, and would naturally be higher in Australia.

APPROXIMATE Cost of Ploughing 3 acres by Tractor in Great Britain.

| | £ | s. | d. |
|---|---|---|---|
| Paraffin (12 gal. at 1s. 2d. per gal.) ... ... ... | 0 | 14 | 0 |
| Lubricating oil (1½ gal. at 3s. 9d. per gal.)... ... | 0 | 5 | 7¼ |
| Grease (6 oz. at 7d. per lb.) ... ... ... ... | 0 | 0 | 3 |
| Wages (one man at 10s.) ... .. ... ... | 0 | 10 | 0 |
| Upkeep (at 2s. 7½d. per acre) ... ... ... | 0 | 7 | 10½ |
| Depreciation (at 3s. 6d. per acre) ... ... ... | 0 | 10 | 6 |
| Interest on capital of plant (at 10½d. per acre) ... | 0 | 2 | 7½ |
| Total cost ... ... ... | £2 | 10 | 10¼ |

If the shallower ploughing practised in Australia is allowed for, and work on 5 acres here is reckoned as equivalent to work on 3 English acres, the cost in Australia would thus be 10s. 2d. per acre.

The figure for paraffin is the lowest average consumption, but the possibility of a reduction in price counterbalances this. The consumption of paraffin varies according to the draught resistance of the soil—that is, a sandy soil requires less per acre than a clay soil. A case of heavy land in Bedfordshire may be mentioned; the paraffin consumption ran into double figures per acre, whereas on some of the lighter soils in Lincolnshire and Lancashire 3 gallons per acre would probably be sufficient.

Exception may be taken to the small average acreage given per day. The writer knows of individual examples of much greater averages (*e.g.*, a Fordson in Devon, drawing a double-furrow, ploughed 25 acres in a week), but when loss of time through breakages and cleaning are taken into consideration, the estimate given will be found to be even a little high. From records of Government tractors, few indeed were found to plough over 10 acres per week. On one estate visited, where eight tractors were employed, the general average was half at work and the other half in the workshop undergoing repair or being taken down for cleaning. It will be seen that the labour of one person only has been allowed for, it being assumed that the plough used was a "self-lift," and that it could be operated by the tractor driver, thus saving the expense of a ploughman.

In the application of the tractor to ploughing, it is necessary that the tractor driver, beside understanding its mechanism, should also have a knowledge of ploughing itself. Hilly ground is unsuitable for tractor ploughing, and unless the machine has a big reserve of power when working on the level, it will undoubtedly stick when going over the gradients. For Australian conditions it would be necessary to apply the self-lift principle to the stump-jump ploughs in use, in order to reduce labour costs to the minimum. Spring connections between the plough and the tractor have proved unsatisfactory in England; it was found impossible to back after striking an obstruction. The usual method is to use a wooden connecting

pin in the draught connection, so that in case of a sudden jerk (from an earth-fast stone or similar cause) the pin breaks, and thereby prevents any overstress on the tractor or plough.

Little ploughing was in progress during the period of my observations, but what work was seen was quite satisfactory. The turning on the headlands was accomplished as quickly as or quicker than with a team of horses, and the width of the headland was not over large. A Fordson tractor, drawing a single-furrow plough (16-inch. cut and 10 inches deep) in the small fields of Jersey, was seen to plough quite close enough to the hedges to satisfy the requirements of all farmers.

The speed at which the tractor travels influences the quality of the ploughing, and for good work a pace of $2\frac{1}{2}$ to 3 miles an hour should not be exceeded.

With the experience of the last two years, adjustments have now been made to tillage implements whereby the tractor may be employed for almost every class of work, including harrowing, cultivating, mowing, seeding, and as a stationary engine for driving machinery. In the last-named capacity the use of a 20-h.p., Titan may be instanced: it was used for pressing hay, 13 tons of hay being pressed daily on a paraffin consumption of 8 gallons. For binders, two machines may be drawn with satisfactory results, but a close watch must be kept for bolts and nuts working loose if any fast travelling is done. A special draught rack should be fitted to the binder pole, with a steering-wheel connection to the attendant's seat on the binder. There would be no saving in labour in the use of the tractor-drawn binder or harvester, because of the necessity of one man being in attendance on the machine itself; indeed, the cost would be considerably more. Further, a tractor used in conjunction with a harvester means a considerable risk of firing the crop. In many cases the exhaust becomes red hot, and there is occasionally a spurt of flame. In the Australian climate, where the straw becomes so dry, and the standing straw would come in such close contact with the exhaust, the risk of fire would be serious.

The farm tractor is totally unsuited for road haulage; it is unsprung, and on metal roads the vibration would be so great as to quickly shake it to pieces. For this class of work a much heavier machine is required, weight being necessary for gripping on the hard surface, whereas the bars and spuds fitted to the wheels perform this function on soil. On earth roads, such as are found on farms, of course, the tractor may be satisfactorily used for haulage.

Details as to type and construction are outside the scope of the present report. As the result of various findings and suggestions, manufacturers have been continually improving the farm tractors; and with the return of normal manufacturing conditions, further improvements may be expected. Machines of British manufacture are comparatively recent arrivals, and experience of them is too brief to warrant comment, but it may be remarked of the Glasgow (a machine with three wheels, all of which are driven) that its makers claim to have eliminated the tendency of the front of the tractor to lift and overturn—a tendency that is evident with the present light class of machine. It is also claimed that the tractor will draw a three-furrow

plough with 10-inch furrows 7 inches deep in medium soil up an incline of one in five. The Austin is another new machine of English manufacture that is attracting much attention from farmers of Great Britain and France, but it has not been long enough in use to justify comment upon it.

In Great Britain, where the cost of horse ploughing is high, the farm motor tractor has undoubtedly come to stay. For two reasons at least, however, the time for its adoption in Australia seems to have scarcely arrived; first, the cost of ploughing by horses here is less than the tractor costs quoted, and second, horses are more reliable. Admittedly, of course, the attention now being centred on the improvement of the tractor, with the attendant possibility of cheaper manufacture and reduced cost of fuel, will be factors in the ultimate popularity of the tractor in this country.

Concerning the figures given, it may again be remarked that they are the best possible in favour of the tractor, and that in England very few machines are working at such a low cost. The appended figures, published by courtesy of one of the provincial War Agricultural Executive Committees, show the work done by tractors over a period of six months (January to July, 1918), with running expenses:—

| | |
|---|---|
| Amount and approximate value of work done:— | |
| 4,224 acres ploughed, at 22s. per acre ... ... | £4,646 |
| 7,041 ,, cultivated, at 7s. 6d. per acre ... | 2,640 |
| | £7,286 |
| Total cost in engineer's fees and bonus, storage, tractor ploughman's wages and bonus, and staff salaries and expenses... ... ... ... ... | £7,760 |

The average cost per acre cultivated is equal to half the cost per acre ploughed. The amount of work done, therefore, totalled $4224 + \frac{7041}{2} = 8166$ units, at a cost of £7,760 (excluding the cost of oil, fuel, and spare parts supplied by the Food Production Department), which worked out at about 18s. per acre.

The total amount of fuel, &c., used was:—

| | £ |
|---|---|
| Petrol (1,089 gallons at 3s. 2d. per gallon) .. ... | 172 |
| Paraffin (39,192 gallons at 1s. 8d. per gallon) ... ... | 3,266 |
| Oil (3,510 gallons at 3s. 6d. per gallon)... ... ... | 614 |
| Grease (1,168 lb. at 7d. per lb.) ... ... ... ... | 34 |
| | £4,086 |

This was equivalent to about 10s. per acre. The consumption per acre worked out thus:—

| | |
|---|---|
| Petrol ... ... | ·14 gallons per acre. |
| Paraffin ... ... | 5·0 ,, ,, |
| Oil ... ... | ·45 ,, ,, |
| Grease ... ... | ·15 lb. per acre. |

The cost, then, per acre amounted to 18s. + 10s. = £1 8s. This did not include the spare parts supplied by the Food Production Department, nor depreciation and interest on capital. It included, however, the cost of fitting all the spare parts, &c., and running repairs. The cost of the spare parts supplied by the Food Production Department was unobtainable.

## Elephant, Para, and Guinea Grasses at Wollongbar.

In April, 1918, the work of planting 2-acre blocks of Elephant, Para and Guinea grasses was carried out under the direction of the Agrostologist. From the start all three grasses gave great promise, and they later afforded a valuable lot of feed during the past summer and winter.

The Elephant grass gave the greatest bulk of feed, and showed remarkable drought resisting powers. When young it was greatly relished by the milch cows, and had a stimulating effect upon the milk yield. During the winter the lower portions of the area were affected by frost, but the grass made a good recovery.

The Para grass completely covered the ground, and formed a dense mass of succulent feed, which remained green throughout the winter. It was more frost resistant than the young Elephant grass, and stood the dry weather very well.

The Guinea grass maintained its reputation, but supplied the greatest amount of feed when other grasses are generally plentiful. It was noticed, after the grass had seeded, that a quantity of seed had germinated in the spaces between the rows (6 feet apart), and it is anticipated that the area will be completely covered in this way.

The success or failure of the whole of these grasses depends upon the manner in which they are treated. They should be kept fed off, and not allowed to become coarse. This especially applies to Elephant grass.

These trials have demonstrated that the growth of these grasses is a most rational way of supplying feed for both winter and summer in this part of the North Coast, supplemented, of course, by other grasses and fodders.—A. H. Haywood, Manager, Wollongbar Experiment Farm.

## Great Britain's Increased Use of Fertilisers.

It is not generally recognised how largely the British farmer availed himself of artificial fertilisers during the war. For the first time for many years the demand exceeded the supply. Sulphate of ammonia, of which formerly we had to export a large surplus, was especially largely used, the consumption by farmers in the United Kingdom rising from 80,000 tons before the war to 269,000 tons in 1919. The consumption of superphosphate rose from 560,000 tons in 1915–16 to 750,000 tons in 1919; while that of basic slag rose from 321,000 tons in 1915–16 to 540,000 tons in 1919. These figures demonstrate more vividly than any words the great increase in the use made by British farmers of the aids to crop production now at their disposal.—*Journal of the Board of Agriculture*, England.

"Thank you for sending along the various pamphlets on fruitgrowing, &c.; also for the *Agricultural Gazette*. I am inclined to think that producers generally would have more quality and better results if they made more use of the Department of Agriculture."—A Pennant Hills Subscriber.

# Farmers' Experiment Plots.

## WINTER GREEN FODDER EXPERIMENTS, 1919.

### Central Coastal District.

J. M. PITT, Assistant Inspector of Agriculture.

WINTER trials were conducted during the season by the Department of Agriculture in co-operation with the undermentioned farmers :—

J. G. Ward, Sherwood, Macleay River.
Felix Kemp, West Kempsey, Macleay River.
Robert Lindsay, Belmore River, Macleay River.
A. J. O'Shea, Belmore River, Macleay River.
R. Richardson, Mondrook, Manning River.
W. Richardson, Dumaresque Island, Manning River.
J. C. Duff, Mount George, Manning River.
O. Collins, Comboyne.
Alex. Smith and Atkins Bros., Bandon Grove, Dungog.
M. Smith, Paterson, Paterson River.

Considering the extreme weather conditions prevailing—a deluge of rain in the autumn (shortly after the sowing in the majority of cases) followed by an extremely cold and dry winter and spring—the results, with one or two exceptions, were satisfactory. It is gratifying to report that, besides an increase in the number of experimenters, the results are gradually being availed of by other farmers in each district, although hardly to the extent looked for, considering the importance of the project.

Under coastal conditions pastures are usually the basis of the food supply, and they depend entirely upon the rainfall. With the continued run of dry seasons, however—and the winters and springs are invariably so—it is obvious that the milk yield and the condition of the cattle must both be low, since the pasture growth is at a standstill. Especially is this the case with the dairy farmer who depends solely upon grazing; with the farmer who supplements his pastures by the growing of fodder crops the position is different. By adopting sound cultural methods, ploughing the land during the summer so that the autumn rains can penetrate, and then using the disc (harrow or cultivator) to conserve it, he practically assures yields of fodder on a rainfall that would be almost useless as far as pastures are concerned. Many instances of successfully combating the effects of drought have been demonstrated by this method during the season. One instance—that at Sherwood—deserves special mention. Here, by adopting the method referred to, the autumn rains were held, and yields of 8 to 15 tons were obtained. In the five months following, 253 points fell; but with the exception of one fall in October, after most of the crops were harvested, the other falls were of no value. Were farmers to adopt farming methods on the lines suggested, instead of trusting to luck, there would probably be fewer appeals for assistance.

The outstanding features of the experiments have been the almost general failure of the oats to recover from the drenching autumn rains and cold winter. In this respect the wheats were far superior. Clarendon, a variety bred at Hawkesbury, was most conspicuous in being the only one to remain wholly standing in the plots, in spite of such adverse conditions. This fact, taken in conjunction with its early maturing and rust-resisting character, assures it a position as a coastal variety of great promise. Canberra, another early maturer (comparatively new to the coast), also showed prominently.

A record (not only for the coast, but probably for any other district) was established at Mondrook with a plot of Huguenot wheat and field peas, the enormous yield of almost 22 tons to the acre being cut. At Bandon Grove a plot of Sunrise oats and Golden vetches yielded 13 tons 3 cwt. three months three days from the time of sowing—probably a record for so short a period.

**Clarendon Wheat at Mondrook.**
The yield was 13 tons 5 cwt. per acre.

The rainfall figures (where available) over the growing period were as follows:—

| Month. | Sherwood. | Kempsey. | Mount George. | Mondrook. |
|---|---|---|---|---|
| | Points. | Points. | Points. | Points. |
| April ... ... | 180 | Nil | 342 | 316 |
| May... ... ... | 563 | 766 | 1,103 | 139 |
| June... ... ... | 97 | 155 | 85 | 980 |
| July... ... ... | 54 | 107 | 177 | 142 |
| August ... ... | Nil | Nil | 21 | 35 |
| September ... ... | 14 | 14 | 190 | 196 |
| October ... ... | 87 | 236 | 215 | 113 |

The preparatory cultural operations were, with one or two exceptions, inferior to previous years, farmers showing a tendency to revert to more careless methods—ploughing large quantities of dry stalk and other rubbish under prior to sowing, and expecting the soil to hold moisture. For best results the first ploughing should be given as early as possible after the

removal of the spring crop, preferably about the end of the year, or earlier; the single 28-inch disc-plough does excellent work on the driest of soils. By doing this the land is in a better state to receive the autumn rains. Another shallower ploughing, or a disc harrowing or cultivating, with a liberal use of the harrow and perhaps the roller, thus ensures a good seed-bed and an ample store of moisture for the needs of the crop.

### Cultural Details.

*Sherwood.*—Soil, fairly rich loam; previous crop cow-corn, spring 1918; ploughed December, disc-cultivated January and February, ploughed again shallower in April and harrowed, and the seed "disced" in on 23rd April, 1919. The germination and growth throughout were good until late in October, when a slight withering, due to hot dry winds, took place. Cutting was commenced early in August, and concluded in November. Owing to the

**Huguenot and Tares at West Kempsey.**
**The crop grew 6 feet 6 inches high and yielded 17 tons 1 cwt. per acre.**

superior cultural methods the oats showed better here than elsewhere. Thew, Clarendon, and Huguenot wheat created a favourable impression, the last and Sunrise oats growing to over 6 feet in height.

*West Kempsey.*—Rich loam soil; land sown to maize for over forty years, with field peas, occasionally, latterly, during the winter; fallowed for twelve months prior to sowing; ploughed in spring, cultivated in December, and ploughed, harrowed, and rolled again previous to sowing on 14th May, 1919. The cultivation methods were satisfactory, resulting in fine plots and heavy yields. It was very noticeable that where the vetches were included with the cereal the latter retained a rich green colour and was more palatable to the dairy stock. Huguenot grew to over 6½ feet, and Thew 6 feet.

*Belmore River (A. J. O'Shea).*—Very rich loamy soil; previously grown maize each summer and field peas during the winter. Disc-ploughed and

harrowed twice after the removal of the maize in April. The cultivation methods were not of the best, stalks and other rubbish not having time to rot. Sowing took place on 21st April, 1919, and the early growth looked very inferior after heavy autumn rain, but the wheats made a remarkable recovery late in the year, Thew, Florence, Warren and Clarendon giving the best results. The oats were attacked with cutworm early in October.

*Belmore River* (*R. Lindsay*).—Very rich loamy soil, cropped previously with maize and other crops. After the maize harvest, stalks and other rubbish were turned under in April, and the plots sown on 23rd April, 1919. The cultivation methods were unsatisfactory, and besides damage by crows, the early growth suffered from heavy autumn rains. Thew, Clarendon, Florence and Sunrise gave best yields, and considering the battering about they received the yields were good.


**Plot of Thew Wheat at Mondrook.**
The yield was 11 tons 19 cwt.

*Mondrook.*—Very rich alluvial soil, previously cropped with winter fodders; ploughed in November and short-fallowed; ploughed again and worked down prior to sowing on 18th April, 1919; cultural methods good. Heavy autumn rains gave the young growth a check, the oats being slowest to recover, all taking rust badly. Thew, Clarendon and Florence were very good, and the record plot of Huguenot and peas gave an immense amount of cow feed. Zealand yielded well as a very late maturer, but was attacked by cutworms. It made excellent hay. Most of the plots grew to over 6 feet.

*Comboyne.*—Red open volcanic soil; previous crop maize; ploughed early in the autumn; harrowed, and seed sown on 9th May, 1919. The cultural operations on this plateau should aim at a greater compression of the soil, ploughing earlier, and only working the top few inches immediately prior to

sowing. Heavy Autumn rains, followed by a dry, cold winter, resulted in very inferior crops. Both the varieties tried (Guyra and Lachlan) appeared unsuitable, and the yields were not weighed.

*Mt. George.*—Rich loamy soil, which had grown maize for a number of years; ploughed during the summer, and harrowed, rolled, and again ploughed previous to sowing on 31st March, 1919; cultural operations were good. Owing to the plots being sown rather too early, they came in for the full force of the heavy autumn rains, and wore a very battered appearance (excepting Clarendon) when inspected in May. A second sowing was made on an old lucerne paddock on 9th June, 1919. Helped by the dry weather following, the first sowing made a rapid recovery. Second-growth yields of over 3 tons were taken off the first-sown plot after the first cut had been made in the flowering stage. Beside ample green fodder, over 6 tons of prime hay was made.

*Paterson.*—Two plots—one ordinary hillside soil, somewhat stiff, and the other a piece of land bordering on a swamp, low-lying and stiff. Fairly good seed-beds were prepared for planting on 4th April, 1919, and Florence and Canberra were sown. Rain in early stages, followed by cold, dry weather, had such a detrimental influence that crops were a failure, and do not figure in the tabled results.

*Dungog* (Bandon Grove).—Rich alluvial soil, previously cropped with ordinary winter and summer crops; ploughed twice before sowing, and harrowed and rolled; cultural methods were good; sown 23rd March, 1919. The heavy autumn rains seemed to favour a rapid, dense growth both of the oats and legumes on this farm, for nothing like it had been seen previously in the district. The mixture proved beyond doubt what an excellent milk producer it is, the milk yield, which had been falling, being increased to its former level when the cows were fed with the green fodder. Pigs preferred the vetches to lucerne.

*Dumaresque Island.*—Rich alluvial clay loam soil, overlying stiff clay; previously sown to various other farm crops; ploughed early in the autumn, and the soil worked down to a fairly good seed-bed; sown 22nd April, 1919. The heavy autumn rains interfered considerably with the growth and yields. Florence showed superior to the rest; Thew and Clarendon were fair. The oats were failures.

TRIALS of Wheat Varieties for Green Fodder.

| Variety. | Mondrook. | Sherwood. | Belmore River. (R. Lindsay.) | Belmore River. (A. J. O'Shea.) | Mount George. (1st sowing, 1st cutting.) | Mount George. (1st sowing, 2nd cutting.) | Mount George (2nd sowing, June.) | West Kempsey. | Dumaresque Island. |
|---|---|---|---|---|---|---|---|---|---|
| | t. c. | t. c. | t. c. | t. c. | t. c. | t. c. | t. c. | t. c. | t. c. |
| Thew .. .. .. | 11 19 | 11 16 | 12 10 | 10 0 | 10 8 | 3 4 | .. | 14 12 | 5 15 |
| Clarendon .. . | 13 5 | 9 15 | 11 0 | 11 10 | 10 3 | 3 15 | 9 14 | .. | 5 $10\frac{1}{2}$ |
| Huguenot .. .. | 14 9 | .. | 8 0 | 8 0 | 11 10 | .. | 10 17 | 11 6 | 10 $1\frac{1}{3}$ |
| Florence .. .. | 13 10 | .. | 10 0 | 10 10 | .. | .. | 10 16 | .. | 6 $14\frac{1}{2}$ |
| Firbank .. .. | .. | .. | 8 10 | 8 10 | 9 19 | 3 7 | 11 0 | .. | .. |
| Warren .. | .. | .. | 8 10 | 9 0 | .. | .. | 10 16 | .. | .. |
| Zealand .. .. | 12 19 | .. | .. | .. | 10 16 | .. | .. | .. | .. |
| Canberra .. .. | .. | .. | .. | .. | .. | .. | 10 17 | .. | .. |

TRIALS of Oat Varieties for Green Fodder.

| Variety. | Mondrook. | | Sherwood. | | Belmore River (R. Lindsay.) | | Mount George. | |
|---|---|---|---|---|---|---|---|---|
| | tons | cwt. | tons | cwt. | tons | cwt. | tons | cwt. |
| Sunrise ... | 13 | 15 | 13 | 6 | 8 | 0 | 9 | 12 |
| Algerian ... | 9 | 10 | 8 | 18 | (F) | | 9 | 17 |
| Ruakura ... | 8 | 10 | 8 | 17 | ...... | | 8 | 6 |
| Guyra ... | ...... | | ...... | | ...... | | 5 | 8 |
| Lachlan .. | 8 | 15 | 11 | 0 | (F) | | 7 | 6 |

(F) indicates failed.

TRIALS of Mixed Legumes and Cereals for Green Fodder.

| Experimenter. | *Quantity of Legume Seed per acre.* | Huguenot and Vetches | | Thew and Vetches. | | Huguenot and Peas. | | Sunset and Vetches. | |
|---|---|---|---|---|---|---|---|---|---|
| | | tons | cwt. | tons | cwt. | tons | cwt. | tons | cwt. |
| Bandon Grove ... ... .. | Vetches, ½ bus. | ... | | ... | | ... | | 13 | 3 |
| Mondrook ... ... ... .. | Vetches, 20 lb. Peas 30 lb. | 15 | 15 | ... | | 21 | 12 | 13 | 5 |
| Sherwood ... ... ... ... | Vetches, 18 and 20 lb. | 11 | 7 | ... | | ... | | 15 | 0 |
| Belmore River (R. Lindsay) .. | Peas, 30 lb. | ... | | ... | | 9 | 0 | ... | |
| Mount George (1st sowing, 1st cutting). | Vetches and Peas, 30 lb. | 11 | 14 | ... | | ... | | ... | |
| Mount George (2nd sowing, June) | Vetches, 30 lb. | 12 | 10 | .. | | .. | | ... | |
| West Kempsey ... ... ... | Vetches, 30 lb. | 17 | 1 | 14 | 4 | ... | | ... | |
| Dumaresque Island .. ... | Vetches, 30 lb. | 4 | 6½ | ... | | ... | | ... | |

* The wheat and oats were each sown at the rate of 2 bushels per acre throughout, except in the Dumaresque Island experiment, where 1 bushel was used.

## SOME RECENT PUBLICATIONS.

AMONG the publications recently issued by the Department of Agriculture and obtainable free on application to the Under Secretary and Director, Department of Agriculture, Sydney, the following are of particular interest to the orchardist :—

Spray Leaflet, No. 1 : Bordeaux Mixture.
,, ,, ,, 2 : The Tobacco Washes.
,, ,, ,, 3 : Lime-Sulphur.
,, ,, ,, 4 : Lime and Tobacco Dust.
,, ,, ,, 5 : Kerosene Emulsion.
,, ,, ,, 6 : Arsenate of Lead.
,, ,, ,, 7 : Resin and Soda Washes.
,, ,, ,, 8 : Iron Sulphide.
,, ,, ,, 9 : Poison Baits for Fruit Flies, &c.
,, ,, ,, 10 : The Swabbing of Grape Vines.
The Mixing of Sprays.
The Double-purpose Spray.
Fertiliser Mixtures for the Orchard.

# The Utility of Poison Gases for Pest Extermination.*

In connection with the general impression that rabbits and other vermin might easily be exterminated by the use of gas, it may be pointed out, in the first place, that though in the last two years of the war at least twenty—and usually twice that number—of gas attacks were made per month against the Germans, and that though thousands of gas shells were fired, the enemy's troops were not exterminated by it. So many factors that tend to neutralise the effects of the gas come into play that enormous quantities of it are required to produce the designed effects.

The first consideration in the use of lethal gas in large quantities is the consideration (*a*) of the operator's life, and (*b*) of human, animal, and plant life in the vicinity. The protection of the former is simple, and consists of the respirator; as to the latter, much care and ingenuity is required. Trees and shrubs do not suffer very much, unless the concentration is very great; but crops and grass are affected. The grass turns yellow quickly, though only the part above ground is destroyed, unless the concentration is very great, and then the whole plant dies. Light concentrations blowing once or twice across a field of French beans, for instance, ruins the plants, though they may struggle along for some time. In France, when firing gas shell when the wind was blowing toward us, the artillery instruction was to the effect that the range should not be less than 1,000 to 2,000 yards beyond our front line, the distance depending on the gas used. In some of the cloud gas attacks men were killed at distances varying from 3 to 5 kilometres (about 2 to 3 miles) from the point of emission of the gas, and casualties were caused at distances up to 9 kilometres. With a small projection of gas, however—say, 200 projectiles, each containing 30 lb. of gas—there would be very little danger to persons 5 kilometres down-wind, especially if they were notified of the danger.

If gas were projected against flying foxes, it would have to be taken into account that a great many wild animals in the area would suffer, and especially those living in the low scrub or on the ground. The gases used are heavy, and, unless a fair wind is blowing, they keep low down and run to the lower ground and into trenches much as water would.

### Character of the Different Gases.

The second consideration would be the kind of gas to be used. If it were to be used in cloud form, the number available would be practically limited to two—chlorine and phosgene. The most deadly cloud gas used in the war

* Compiled from particulars kindly supplied by Major H. W. Wilson, O.B.E., M.C., lately Chemical Adviser 5th Army, and Corps Gas Officer, A.I.F., in reply to an inquiry from the Under Secretary and Director of Agriculture as to the possibility of poison gases being useful for the extermination (in particular) of rabbits and flying foxes.

was phosgene. It was used by the British for cylinder attacks, in projectors and in shells. Phosgene is so deadly that if a fairly low concentration (say, 1 in 5,000 to 1 in 10,000) is breathed for about half an hour and the animal moves about much, it is almost certain to drop dead suddenly from 10 to 12 up to 24 hours later. A high concentration causes a spasm in the throat, and the animal dies quickly and suddenly. Gas shells are not worth considering for the purpose of exterminating vermin, as their effective use necessitates a target confined to the area shelled and remaining at a low altitude. The four gases principally used in shells were phosgene and diphosgene, chloropicrin, dichlorethyl sulphide, and diphenyl-chlorarsine.

Phosgene (and diphosgene is similar in its action) has been mentioned. Chloropicrin does not vaporise easily, and, though it is a deadly gas, its action is much slower than phosgene. One of its advantages as a weapon is that it is cumulative in action. It has a faint "chemical" smell.

Dichlorethyl sulphide (called by the Germans "yellow cross gas") is the "mustard gas" often referred to and is very dangerous to handle. Its not unpleasant smell—like cress or garlic—is very faint, and many men could not smell it at all. The effects from contact with it do not show until about six hours later, and exposure to it leads to blindness for two or three weeks and sore eyes for considerably longer. If the liquid is spilt on the skin, yellow bladdery blisters subsequently develop. Leather saturated with oil is a protection from the liquid; but untreated leather, rubber, and most other materials are quite ineffective. If breathed in high concentrations the inner lining of the lung is destroyed. If a few pints were spilt in a dugout it was rendered dangerous for four or five weeks, and many men lost their lives through sleeping in such dugouts, being unable to detect the presence of the gas.

Diphenyl-chlorarsine (or diphenyl-cyanarsine, which is quicker in its action) was called by the Germans "blue cross gas." It was in the form of a solid, contained in a strong glass bottle which was broken and its contents atomised by the explosion of the shell. The gas is as deadly as phosgene, and is composed of such fine particles that in a dense cloud of it protection from it is difficult. If it could be projected as a dense smoke it would be an effective weapon against the flying fox, but the operation would necessitate the use of a special respirator. The cloud would be dangerous 3,000 to 4,000 yards down-wind (or, say, 2 to 3 miles), and low-lying pools of water would be contaminated.

### Use of Gases for Killing Rabbits.

In considering the use of these gases for the purpose of killing rabbits, the cloud method may be dismissed as impracticable. Even on a dull, still day, sufficient gas to be fatal would not enter the burrows. Other application, however, might be successful. The gas (say phosgene) could be introduced into the burrows from a cylinder by means of pipes, which could be made of such a size that they could be handled by one man. Careful and well-trained men would be essential, otherwise casualties would occur. The use of chloropicrin to contaminate open burrows would be scarcely feasible, as its chemical

smell and its lachrymatory effect would frighten the animals out of the burrow before they had breathed sufficient to cause death. If the action of dichlorethyl sulphide were not so insidious, and, therefore, so dangerous to those using it, it might be worth trying in burrows. The simplest way would be to throw a pint into the entrances of a burrow, when the animals would carry it to all parts on their feet and fur. Anybody handling the rabbits or the soil at the entrance of the burrow up to five or six days after, however, would be affected by the gas, and some bad blistering would result. As an illustration of this point, a case might be mentioned where over 200 men were gassed by mustard gas in a system of tunnel dugouts in one night, as a result of men coming in from shelled areas and carrying the material in on the mud on their boots.

### Application to Flying Foxes.

The whole question of killing flying foxes by the use of cloud gas depends upon the height at which they camp and what concentration would kill them in a certain time. No figures relative to the concentrations of gas necessary to kill different animals are available just now, but numerous experiments have proved that men and goats have equal resistance to practically all the gases tested, and that animals vary in their sensibility to certain gases. If the flying foxes were camped, say, 20 to 30 feet from the ground, the gas might be projected from cylinders well into the air by means of pipes, and provided they could be kept under a concentration of 1 in 3,000 to 1 in 5,000 for half an hour (or a higher concentration for a shorter time), the operator would certainly be quite satisfied with the casualties.

The important question arises—would the creatures wait after they smelt the phosgene? The gas has an unpleasant smell—" like lilac flower," says the Frenchman, " like bad hay " the Russian—and most men who get a smell of it spit immediately after. Dr. Lucas, in " Animals of Australia," says that the natives light fires under the camping places of the flying foxes to stupefy them with the smoke and then knock them down with sticks, which suggests that they would not shift for the smell of the gas. Smoke might perhaps be used to assist in making the gas rise to them.

## The Spread of Contagious Mammitis

The principal means whereby the disease is spread at the present day is undoubtedly through the use of contaminated milking-machines. The milking is in itself in no way to blame; milking-machines do not cause contagious mammitis; they only act as a first-class medium for the conveyance of the disease from one cow to another. Next to this comes hand-milking. Contaminated hands will spread the disease as easily as the machine; but in milking by hand the chances are in favour of the disease being sooner detected, resulting in earlier application of preventive measures.—A. R. Young, M.R.C.V.S., in the *New Zealand Journal of Agriculture.*

## Notes on Californian Experience with Apple Mildew.

Several points in an article in the April number of the Californian publication *Better Fruit* are of particular interest, especially in the light of local experience.

(1) It is claimed that lime-sulphur has proved an effective spray in California for the control of mildew in apples.

This Department, however, has not found lime-sulphur consistently effective in controlling apple powdery mildew.

(2) Contrary to expectations, powdery mildew of the apple has established itself in the hot, interior, irrigated districts of California.

As a few varieties of apples are promising very well in the orchard at Yanco Experiment Farm, and as woolly aphis gives no trouble in that climate, it is quite within the realms of possibility that apple-growing will play a part on the Murrumbidgee Irrigation Areas. Up to the present, powdery mildew of the apple has not developed in Yanco orchard, but evidently in similar climates in California it gives trouble. Moreover, in our tableland districts mildew often shows as badly in dry seasons as in wet ones, and should apples be planted at all extensively in our inland districts a careful watch should be kept for this disease.

(3) Though lime-sulphur can be used in the spring spraying in California, it cannot be used during the hot summer months, as when it collects on a fruit which is exposed to direct action of the sun, scalding ensues.

As up to the present there has been no occasion to use fungicides on apples growing in our inland orchards at Wagga and Yanco, the Department cannot speak from actual experience, but there is no reason to doubt that burning may take place as on citrus fruits in our coastal districts when fully exposed to the sun.—W. J. Allen.

## Agricultural Machinery and Farm Book-keeping.

With the rapidly extending use of agricultural machinery and other factors which promise to make for economy in the cost of production, profit and loss in particular methods of farming will have to be weighed more carefully, and in the case of expensive equipment, such as farm tractors, which depreciates rapidly, book-keeping is necessary in order that such loss of capital may be disclosed.—*Journal of the Board of Agriculture*, England.

## Cause of Second Growth in Potatoes.

Second growth in potatoes is, as a rule, due to rain following on a dry spell; it has for that reason been prevalent in our coastal districts during the last two seasons. Since the defect is a seasonal one, the only remedy is to change to a variety more suitable to the incidence of the rainfall in the district where the rains, for instance, tend to be late in the growing season, either an early variety that will mature before the rains, or a late variety that will not have matured the tubers till afte the usual rains have fallen, might be tried. Tubers showing second growth should on no account be used for seed, as they are apt to produce plants constitutionally weak.—A. H. E. McDonald, Chief Inspector of Agriculture.

# Grain Sorghums in Northern Districts.

R. W. McDIARMID, Inspector of Agriculture.

PLOTS of the grain sorghums were sown by two farmers in conjunction with the Department during last season:—

J. T. Maunder, Pallamallawa.
J. F. Chick, Tenterfield.

The varieties sown were Milo, Feterita and Kaoliang, with Early Amber Cane at Pallamallawa and Planter's Friend at Tenterfield to enable comparisons to be made with the fodder sorghums. The plots at Pallamallawa were sown on 23rd September and those at Tenterfield on 20th November.

The Pallamallawa plots had to be utilised for grazing purposes owing to the great scarcity of green feed and the fact of their being located in a large cultivation paddock. The seed was sown in drills 3 feet apart, using 4½ lb. per acre and no manure. The growth was very satisfactory, and even after being fed off several successive growths were made; in fact, good feed was obtained from the plots right up until winter time. The object of the experiment (the production of grain) was thus missed, but the drought resistance and suitability of the plants for grazing purposes in the dry districts were plainly demonstrated. Their hardiness and the small cost for seed per acre should justify more extensive sowings in the dry districts and help to fill a long-felt want. They were readily eaten by the stock (chiefly sheep), and no ill effects were noticed. Care should be exercised in grazing stock on these sorghums, however, for though cases of poisoning are rare and none has occurred in this State, instances have been recorded in the United States of America.

The Tenterfield plots were utilised for green feed when in head, but a portion of each plot was reserved for grain. In both respects the results were highly satisfactory. Cattle, pigs and working horses all ate it readily, especially the Milo and Feterita, and thrived well on the fodder. The pigs preferred the heads, while the horses and cattle ate the complete plant. For green feed, Planter's Friend gave a much heavier bulk than any of the grain sorghums. After harvesting the grain the cattle were turned into the paddock, and they cleaned up the remaining stacks of Milo and Feterita, but not so readily the Kaoliang. The yields per acre of grain were estimated in May to be about 40 bushels per acre, but suitable methods of harvesting and threshing were not at hand and the weather was unfavourable, consequently a considerable amount of seed was lost. The amounts actually threshed per acre were:—

| | |
|---|---|
| Kaoliang ... ... ... .. | 28 bushels per acre. |
| Feterita .. ... ... ... | 17 ,, ,, |
| Milo ... ... ... ... ... | 12 ,, ,, |

The Kaoliang variety proved the earliest in heading, followed closely by Milo; Feterita was much later. The heads were cut off by hand and the seed removed with the broom millet hackler, but the heads are too dense for such a machine for the separation of all the grains. The threshed grain has been reserved for seed purposes and not fed to the stock; but in other countries it has been found more suitable than maize for horses in the hot weather. In feeding value these grains compare very favourably with maize, and when better known they will replace it in many districts.

Both experimenters were very pleased with the results and intend making more extensive sowings in the coming season.

## Vineyard Notes for January.

It is fortunate that the dry weather has broken to the extent that most of the vineyard areas have received beneficial falls of rain. As a result there has been a considerable improvement in the crop. Table grapes are showing well, and a good crop of fine fruit appears to be assured.

Vines in the Riverina are looking well and carry good crops, mostly wine varieties, of course. Reports from the Hunter indicate improved conditions and prospects owing to recent rains, and the yield promises to be fair to good, particularly upon young vineyards.

Up to time of writing some black spot and downy mildew have been observed in Cumberland, but most growers are taking no risk and are keeping the vines well sprayed with Bordeaux mixture.

In spite of all warnings some growers still persist in neglecting to spray. This attitude it is very difficult to understand. They may get through safely, but the bump will come sooner or later. Others waste their time, labour and money upon proprietary mixtures and powders, many of which are imported. The sooner this practice is discarded the better. Australian-made bluestone, with Australian lime-water and some energy, are all that are required. Just as a glittering object is not necessarily gold, neither is an agent's pamphlet gospel.

By the time these notes appear early grapes will be on the market, and mid-season varieties will be ripening. Do not neglect the vines because the crop is off them. Let them retain their leaves as long as possible, even spraying thoroughly after the crop has been harvested. The wood must be matured to prepare for the next year's crop, and the leaves are the medium for this function. Vines defoliated by disease produce poor crops in the following year.

Keep the cultivation up so that the ground will be loose and free from weeds. Under irrigation, or even under conditions where limited watering is possible, every opportunity should be taken of using available water in order to secure high-quality fruit. Water applied as irrigation to table grapes is going to be sold later on at a good price per pound—in the case of wine grapes at per ton. There is every indication of high prices ruling for grapes of all classes in the coming season, and such will continue so long as the market is under-supplied.—H. E. Laffer, Viticultural Expert.

# Licks for Different Classes of Country.

F. B. GUTHRIE.

THE substances used in stock licks consist for the most part of substances like calcium phosphate, bonedust or bone-ash, and common salt, which may be regarded as supplying the saline matter absent or deficient in the natural herbage, or else of substances which have a purely medicinal, as apart from a food, value, such as sulphate of iron, sulphur, Epsom salts, gentian, turpentine, &c. The latter do not occur naturally in soil, water, or herbage, and are given as purgatives, tonics, vermifuges, and for other medicinal purposes, to ailing stock.

The accompanying list (furnished by the Chief Inspector of Stock) of formulæ recommended by the Stock Department at different times and for different purposes indicates the nature of the substances principally employed :—

(1) *Stomach Worms and Fluke—*

(Annual Report, 1895, Mr. S. C. Pottie, M.R.C.V.S.)

| | |
|---|---|
| Liverpool salt ... ... ... ... ... ... | 200 lb. |
| Sulphate of iron ... ... ... ... ... ... | 15 ,, |
| Sulphur ... ... ... ... ... ... | 10 ,, |
| Powdered charcoal ... ... ... ... ... | 10 ,, |
| ,, gentian ... ... ... ... ... | 2 ,, |

(2) *Worms in Lambs—*

(*Agricultural Gazette*, April, 1910, Mr. Max Henry, M.R.C.V.S.)

| | |
|---|---|
| Liverpool salt ... ... ... ... ... ... | 10 lb. |
| Bone-meal ... ... ... ... ... ... | 5 ,, |
| Sulphate of iron... ... ... ... ... ... | ¼ ,, |

(3) *Worms in Sheep—*

(*Agricultural Gazette*, August, 1911.)

| | |
|---|---|
| Sulphate of iron ... ... ... ... ... ... | 1 part. |
| Bone-meal ... ... ... ... ... ... | 5 parts. |
| Liverpool salt ... ... ... ... ... ... | 30 ,, |

(*Agricultural Gazette*, February, 1913, Mr. Max Henry, M.R.C.V.S.)

| | |
|---|---|
| Calcium phosphate ... ... ... ... ... | 5 parts. |
| Sulphate of iron ... ... ... ... ... | 1 part. |
| Liverpool salt ... ... ... ... ... ... | 40 parts. |

(Annual Report, 1895.) No quantities given.

(*a*) Salt and sulphur.
(*b*) ,, ,, sulphate of iron.
(*c*) ,, ,, turpentine.
(*d*) ,, ,, sulphate of iron and turpentine.
(*e*) ,, ,, sulphur and sulphate of iron.
(*f*) ,, ,, sulphate of iron and Hayward's Specific.
(*g*) ,, ,, lime.

(4) *Lung Worm in Sheep*—

(Annual Report, 1891.)

| | |
|---|---|
| (*a*) Salt. | |
| (*b*) Sulphate of iron ... ... ... ... | ½ cwt. |
| Liverpool salt ... ... ... ... | 1 ton. |
| (*c*) Turpentine ... ... ... ... ... | 1 pint. |
| Liverpool salt ... .. ... ... ... | 28 to 56 lb. |

(5) *Lick for Defective Bone Development*—

(*Agricultural Gazette*, July, 1909, F. B. Guthrie.)

A lick of bone-ash mixed with molasses, with a little salt added.

(6) *Osteomalacia*—

(*Agricultural Gazette*, March, 1912.)

| | |
|---|---|
| Bone-meal ... ... . ... ... ... | 20 parts. |
| Crushed salt ... ... ... ... ... ... | 5 ,, |
| Sulphate of iron ... ... ... ... ... | 3 ,, |

(*Agricultural Gazette*, May, 1912.)

| | |
|---|---|
| Salt ... ... ... ... ... ... ... | 40 parts. |
| Bone-meal ... ... ... ... ... ... | 10 ,, |
| Sulphate of Iron ... ... ... ... ... | 1 ,, |

(Science Bulletin No. 12, p. 23.)

| | |
|---|---|
| Bone ash ... ... ... ... ... ... ... | 1 cwt. |
| Common salt ... ... ... ... ... ... | 5 or 6 lb. |
| Sulphate of iron ... ... ... ... ... ... | 4 lb. |

Molasses.—Sufficient to make the mass coherent and to flavour it.

(7) *Lime for Stock.*

(*Agricultural Gazette*, December, 1911, Mr. I. G. Palgrave, M.R.C.V.S.)

| | |
|---|---|
| Salt ... ... ... ... ... ... ... | 5 parts. |
| Lime ... ... ... ... ... ... ... | 1 part. |
| Sulphur ... ... ... ... ... ... .. | 1 ,, |
| Sulphate of iron... ... ... ... ... ... | ½ ,, |

(8) *Anti-partum Paralysis in Sheep*—

(Annual Report, 1910.)

| | |
|---|---|
| Epsom salts ... ... ... ... ... ... ... | 7 lb. |
| Sulphate of iron ... ... ... ... ... ... | 6 ,, |
| Coarse salt ... ... ... ... ... ... | 100 ,, |

(9) *Licks for "New Disease in Sheep."* (*Black disease*)—

(Annual Report, 1895, Mr. S. C. Pottie, M.R.C.V.S.)

| | |
|---|---|
| Common salt ... ... ... ... ... ... | 100 lb. |
| Glauber's salts ... ... ... ... ... ... | 25 ,, |
| Sulphur ... ... ... ... ... ... ... | 10 ,, |
| Hyposulphite of soda ... ... ... ... ... | 1 ,, |
| Quinine sulphate ... ... ... ... ... ... | 1 ,, |
| Charcoal (powdered) ... ... ... ... ... | 10–20 lb. |

Another lick may be composed of equal parts of Liverpool salt, Epsom or Glauber's salts, sulphur and ginger; or

| | |
|---|---|
| Liverpool salt ... ... ... ... ... ... | 200 lb. |
| Glauber's or Epsom salts . ... ... ... ... | 25 ,, |
| Nitre ... ... .. ... ... ... .. | 25 ,, |
| Sulphur ... ... ... ... ... .. ... | 20 ,, |
| Chlorate of potash ... ... ... ... ... ... | 2 ,, |

It will be seen that only a few of the foregoing contain substances like bone-meal, bone-ash, calcium phosphate or lime, prescribed to supply material deficient in the soil or herbage (see Nos. 2, 3, 5, 6 and 7) and which may be regarded as bone-forming salts; the bulk of the ingredients have medicinal action and are not met with in the soils. The cases of defective bone-development and osteomalacia, however, appear to provide a clear-cut issue in connection with the provision of material lacking in the soil. It has been fairly conclusively proved (see Science Bulletin No. 12, "Notes on Osteomalacia") that the soils and herbage of country on which this disease is prevalent are deficient in lime-salts and phosphates, and that the bones of animals affected contain less phosphate of lime than those of healthy animals. The addition of these ingredients to the daily ration, and the use of licks containing phosphate of lime, is indicated as a remedy and its application has been found to be of great benefit.

### Natural Licks.

The whole question of the use of licks of varying composition for different classes of country is distinctly interesting and well worth systematic investigation. Samples of earth are frequently received for examination which, it is stated, are used as a lick by stock, especially sheep, and which are assumed to contain substances lacking in the soil. In some cases it is stated that such "natural licks" are a cure for certain diseases. The following notes set down the general results obtained from samples reaching this laboratory from time to time at haphazard, the laboratory numbers being quoted against each one for the sake of reference in case of inquiry.

Such a sample was obtained through the Stock Branch from Quidong, Burnimbah Station, Bombala (Lab. No. M 6009). This was credited with certain curative properties. The sheep were said to eat this earth freely, and the station to be free from Black disease. The sample on analysis was found to contain:—

| | | |
|---|---|---|
| Lime (CaO) ... ... .. ... ... ... | 0·9 | per cent. |
| Magnesia (MgO) ... ... ... .. ... | 0·1 | ,, |
| Sulphates ($SO_3$) ... ... ... ... ... | 0·3 | ,, |
| Chlorine (Cl) ... ... ... ... ... | 0·1 | ,, |
| Equivalent to common salt (NaCl) ... ... | 0·17 | ,, |

The amount of saline matter is not very different from that in soils. The deposit has an unctuous feel and taste, and is probably attractive to sheep on this account.

In this connection it is interesting to note the composition of an artificial lick which according to newspaper paragraphs is "said to be used with good results against Black disease." This lick is composed of salt 10 lb., lime 1 lb., and sulphur ¼ lb. I am unable to trace the original source of this formula. Even assuming that this lick possesses curative properties, it will be seen that the composition of the natural lick just referred to does not resemble this one at all, as the proportion of lime to salt is almost reversed and the natural lick contains no sulphur. I understand, however, that Dr. Dodd, of the Stock Branch, has stated that these ingredients cannot possibly have any effect on Black disease.

Another sample of earth that was supposed to be similar to that from Quidong, and which was relished as a lick by sheep, was received from Jindabyne. In this case (Lab. No. RII 94) analysis showed the following composition :—

| | | |
|---|---|---|
| Soluble in acid | Lime (CaO) ... .. ... | 0·45 per cent. |
| | Potash ($K_2O$) ... ... ... | 0 58 ,, |
| | Phosphates ($P_2O_5$) ... ... | 0·11 ,, |

No chlorides or sulphates were present, and the total aqueous extract was only 0·07 per cent. The sample was granite detritus and differs in no respect from what one would expect from a weathered granite containing orthoclase felspar. It is richer in potash and lime than average granite soils and is slightly alkaline. This, no doubt, makes the taste agreeable to the sheep, and may possibly exert a slightly purgative action. This was also unctuous to feel and taste on moistening.

Apart from any reputed curative action, a number of natural licks have been sent for examination from time to time, analysis of which shows that in many cases they do contain saline ingredients which may possibly be lacking in the soil and herbage. Some of these contain fairly large proportions of common salt. Two samples of earth from Gunning (Lab. No. 219), which sheep were observed to lick continually, contained considerable quantities of common salt, one being apparently impregnated with it. The exact proportions of salt were, unfortunately, not determined. Another sample from Belltrees Station (Lab. No. M 2867) also contains appreciable quantities of common salt. Its full analysis is as follows :—

*Aqueous extract.*

| | |
|---|---|
| Chlorine (Cl) ... ... ... ... | 0·144 per cent. |
| Sulphuric acid ($SO_3$) ... ... ... | 0·226 ,, |
| Phosphoric acid ($P_2O_5$) .. ... ... | 0·04 ,, |
| Oxide of iron and alumina ($Fe_2O_3$, $Al_2O_3$) | 0·002 ,, |
| Lime (CaO)... ... ... ... ... | 0·012 ,, |
| Magnesia (MgO) ... ... ... ... | 0·073 ,, |
| Potash ($K_2O$) ... ... ... ... | 0·008 ,, |
| Soda ($Na_2O$) ... ... ... ... | 0·099 ,, |

There are probably present in the following combination :—

| | | |
|---|---|---|
| Common salt ... ... .. | 0·238 per cent. | (16⅗ grains in 1-lb. soil.) |
| Sulphate of magnesia ... | 0·220 ,, | (15½ ,, ,, ,, ) |
| Sulphate of alumina ... ... | 0·008 ,, | ( ½ ,, ,, ,, ) |
| Sulphate of potash .. ... | 0·015 ,, | ( 1 ,, ,, ,, ) |
| Sulphate of lime ... ... | 0·03 ,, | ( 2 ,, ,, ,, ) |

In this case the quantities of common salt and Epsom salts present were sufficient to impart a saline and slightly bitter taste which doubtless made it palatable to the sheep, the Epsom salts (sulphate of magnesia) acting as a mild aperient.

Another sample of earth containing some saline matter, which was said to be eaten by horses, was received from Cooma (Lab. No. M 377). This gave a total aqueous extract of 0·37 per cent., of which 0·12 per cent. consisted of common salt, the remainder being alum and lime salts, together with fine clay, which it was difficult to separate from the soluble salts. Here also, no doubt, the unctuous nature of the finely divided clay was the attraction rather than the amount of saline matter, which latter is not great.

The following examples of earth eaten or licked by stock were found to contain carbonate of lime, and it is doubtless owing to the lack of this substance in the soils of the neighbourhood that such calcareous earth comes to be used as a lick One sample (Lab. No. M 6203) comes from Mount Nombi, Mullaley. It is reported that sheep take to licking the banks of the creek wherever this earth is found. It was found to contain:—

| | | |
|---|---|---|
| Carbonate of lime ($CaCO_3$) ... ... ... | 71·11 | per cent. |
| Carbonate of soda ($Na_2CO_3$) ... ... ... | 0·82 | ,, |
| Common salt (NaCl) ... .. ... ... | 1 01 | ,, |

The remainder consists of sand and clay; the earth has a weak alkaline reaction and a saline taste. The other sample (Lab. No. 1011), taken from "lickholes" at Carroll, of which a fairly complete analysis was made, was analysed as follows:—

| | | |
|---|---|---|
| Moisture and volatile matter ... ... ... | 14·6 | per cent. |
| Insoluble matter ... ... ... . ... | 55·2 | ,, |
| Calcium carbonate ... ... ... | 24·3 | ,, |
| Sodium chloride ... ... ... ... ... | trace | |
| Potash ... ... ... ... ... | trace | |
| Magnesia ... .. ... .. ... ... | 1·0 | ,, |
| Phosphoric acid ... ... ... ... ... | trace | |
| Oxides of iron and alumina ... ... ... | 5 6 | ,, |
| | 100·7 | |

With the exception of the last two, which are samples of calcareous earth or impure limestone, the samples are for the most part of a sticky, greasy feel to the tongue, and it is this property that no doubt renders them attractive apart from the small proportion of saline or purgative substances they contain. In connection with this matter, it may be of interest to refer to an analysis of so-called "Edible Earth" from Fiji, (see *Journal Royal Society of N.S.W.*, Vol. 33, p. 224). This earth is eaten by the natives, especially by the women, and on analysis proved to be silicate of alumina (kaolinite) of the composition $Al_2O_3\,(SiO_2)_2\,(H_2O)_2$ with about 7·6 per cent. ferric oxide as mechanical impurity. It, therefore, contains nothing that can exert any medicinal action or feeding value, and it must owe its popularity to the peculiar feel and taste of this unctuous clay.

It is to be noted that earth-eaters commonly suffer from intestinal worms, and it would be of interest to observe whether the same effect is produced in the case of stock licking such clayey deposits.

The analyses quoted above were carried out by different officers of the Chemist's Branch, Department of Agriculture.

## SULPHATE OR CARBONATE?

A CORRESPONDENT who proposed to make up from one of the Department's formulæ a manure mixture for his passion fruit vines, inquired if he might safely substitute carbonate of lime for the gypsum prescribed. He was advised that if such substitution was made the carbonate of lime would be better applied separately, about two to three weeks beforehand. While it had not the same strong action on sulphate of ammonia as slacked lime, it had a decided action, especially if warm. It was on this account that sulphate of lime was recommended for mixing.

# Popular Descriptions of Grasses.

[Continued from page 787.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

## THE DANTHONIA GRASSES.

THE Danthonia species are probably the most important economic grasses of New South Wales, their importance being due (*a*) to their abundance in coastal, tableland, and western pastures, and (*b*) to their highly palatable qualities.

The Danthonias are fairly cosmopolitan grasses, being found all over Australia, in New Zealand, South Africa, and in the warmer parts of America and Europe. In New Zealand they are recommended only for the poorer soils of the South Island; but in the North Island they are considered very valuable pasture grasses, and are credited with carrying two sheep to the acre.

A Danthonia grass is one of the easiest to recognise in the field, but so closely are the numerous species related to each other that they appear to have been "lumped together" under the same species rather too much. Now that their economic value is being particularly noticed and their importance emphasised, the correct naming of this group is under investigation. As far as experience goes, there is no useless Danthonia grass, but some are much better than others, and their correct naming is a matter of some importance.

Typical Danthonia grasses are represented in the accompanying figures. They are all fine-leafed tussocky grasses, but not by any means tall, the average height being about 1 foot and seldom more than 2 feet. They are characterised by the presence of white hairs on the flowering glumes, which present a glistening and attractive appearance when the flowers open in the spring months. They thus often receive the names Silver-top, White-top or Fluffy-top. The old vernacular name, Wallaby grass, is not now nearly so common.

In New South Wales the Danthonia grasses are commonest on the tablelands and slopes, where they easily constitute 90 per cent. of the dominant grasses in well-managed pastures—sometimes, indeed, monopolising the whole situation. In coastal districts they are generally absent from couch and paddock-love grass associations, but are common in newly cleared paddocks, in scrub lands, and very often in well-worked fallowed paddocks. In the western districts they are just a little less abundant than on the slopes and tablelands. The Danthonia grasses can therefore be termed the commonest and most widely distributed grasses of the State, and without them our pastoral industry would suffer considerably.

*Habits.*—The Danthonias are perennial in character, and provide feed during the greater portion of the year. They are the best winter native grasses we possess, and even in the most elevated portions of New England will stand feeding off in the coldest of seasons. This winter growth, which


**Fig. 1.**—*Danthonia longifolia.*

A typical Danthonia grass in the coastal districts. Note the absence of hairs at the leaf-sheaf orifice, which distinguishes it from the other Danthonias.


Fig. 2.—*Danthonia bipartita.*
A typical Danthonia grass of the semi-arid western districts. Note the hairy bulbous root-stock, a drought-resistant characteristic.


**Fig. 3.**—*Danthonia pallida.*

Common on the Tablelands. Note the long curled leaves which distinguish it from other Danthonia species.

makes the Danthonias particularly valuable, is remarkablv absent from most of our native grasses. The Panics, the Eragrostis, Setaria and Paspalum (all previously described) are hot weather grasses, and in the interior winter feed has generally to be provided by herbage such as burr, trefoil, barley grass, &c. Such annual short-lived herbage should not be allowed to crowd out the Danthonia grasses, which are a more valuable heritage than the short-lived aliens.

The Danthonias are tussocky in habit, but they stool considerably, and will stand a great amount of grazing. The leaves are soft and narrow in character. Some of the Danthonias are rather hairy in type, particularly those of the western plains, but evidently this is no drawback as far as palatability is concerned. During the hot summer months the grass dies off considerably, but can be revived in a wonderful manner by rain.

*Seeding Habits.*—The Danthonia grasses set seed very readily and abundantly from October to December. Unfortunately, the ripening of the seed is irregular, and owing to its fluffy nature it is difficult to harvest and to sow. The flowering glumes completely enclose the seed until it is ripe; then they burst open and the seed is distributed far and wide by the wind. The fluffy, light nature of the seed has certainly a great deal to do with the wide range of the grass.

*Palatability.*—The value of the Danthonia grasses in this respect, both for cattle and sheep, has been well proved by every pastoralist. The forms that grow abundantly in the coastal districts (*Danthonia longifolia* and *D. racemosa* types) fatten horses and dairy stock very quickly; while on the tablelands and slopes and in the interior some of the best sheep in New South Wales are raised on Danthonia grasses alone. Even when other grasses are completely dried up the Danthonias will produce a fair amount of greenness in the bottom growth, and it is due to such feed that the Riverina can carry excellent sheep during a dry spring and summer.

*Danthonias under Irrigation.*—It has been noticed that Danthonia grasses do particularly well under irrigation. At Yanco Experiment Farm an irrigated pasture of this grass appears to provide more feed than any other grass tried. In New Zealand the Danthonia grasses are recommended both for very dry soils and for very wet soils, and they appear to adapt themselves to both situations as far as this State is concerned.

*Commercial possibilities.*—The Danthonia grasses must, in time, play an important part in areas where paddocks are laid down to grass, particularly in the more closely settled localities. The germination of the seed is very satisfactory, averaging 60 per cent., and it appears a fairly easy grass to raise from seed, if it is sown in early spring or in autumn. Its growth is rapid, even under fairly dry conditions. Plots of Danthonia grasses have been established at the experiment farms without much difficulty. The seed of the New Zealand varieties is already on the market, but experiments have proved that our own varieties are far superior to these, and it therefore seems remarkable that we should have to introduce seed from New Zealand when it grows so abundantly in our own State.

# Soil Improvement for Maize.

## I—Manures and Fertilisers.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

The improvement of the soil for maize-growing is a question that is yearly becoming of more importance. The time has passed in most districts when "the face of Mother Nature can be tickled and she will laugh herself into a bounteous crop," and the 100-bushel yields which the early settlers obtained by hoeing the maize in between the stumps on newly-felled scrub lands are less frequently heard of.

The maize grower of to-day knows that in order to get heavy yields he has to use the best methods of seed selection and cultivation, but the improvement or maintenance of soil fertility is even more important. Every farmer who has handled virgin soil must have observed the change produced in it by continued cultivation. The mellow tilth, the moisture-retaining capacity, and the fertility give place to a soil which becomes heavier, which dries out more quickly, and bakes and cracks more easily, turning over in big hard lumps and clods when ploughed. It is only by a study of the cause for this change and of what materials this virgin soil has lost that any successful attempt can be made to restore it to its former likeness.

The first examination reveals that the greatest loss is that of organic matter or humus. The accumulation of vast quantities of leaf mould in the forest or scrub during thousands of years has added large amounts of organic matter to the soil, which begin to disappear when the soil is cultivated. It is now known that the aeration of the soil by cultivation oxidises the organic matter eventually into a form (particularly nitrates) in which it can be made use of by plants as food material, and that at the same time this oxidised organic matter loses its capacity for retaining moisture. Cultivated crops like maize, root crops, &c., which are grown in drills, therefore consume this organic matter more quickly than wheat and broadcast crops which are not cultivated. It is easy to see, then, why the continued cultivation of maize or potatoes, although grown on land which was originally very fertile, depletes the soil of its virgin fertility more quickly than most other crops. It has been calculated that land cultivated for thirty years has lost 30 to 35 per cent. of its organic matter. In addition to the loss of organic matter, a crop of maize removes from the soil larger amounts than most other crops of the chief materials of plant food—nitrogen, phosphoric acid and potash.

The three chief means of restoring or making good these losses of organic matter and plant food are (1) rotation of crops; (2) cover cropping and green manuring; and (3) the application of manures and fertilisers. On some alluvial soils on the banks of streams, a flood deposit of rich silt makes good this loss naturally; but in many cases, partly because of efforts made to

prevent it, no such benefactor has appeared in recent years, and eventually the means enumerated of restoring lost fertility must be introduced if profitable crops are to be raised. In spite of the fact that the soils of the State generally are poorer as the result of continued cultivation than they were as virgin soils, the value of land has increased, and with the influx of population which is bound to come, they will increase still further. To keep pace with this increase, more attention must be given to methods ensuring bigger and more profitable crops. Of these methods, the basic factor is the scientific improvement of the soil's fertility; and, whether as renters or as owners of land, those who find themselves unable to make sufficient profits from their labour, or sufficient interest on their capital, will have to make way for those with increased knowledge who can.

The issue has been evaded by the old settlers by moving to virgin soil when the "working out" effect of cultivation has become apparent, but new land is rapidly becoming more scarce. National poverty must in the end surely overtake us if no effort is made in the direction indicated. It may be urged that such a day is yet a long way off; nevertheless, if the present-day farmer is careless of the morrow, the question must be faced by the coming generation. For that generation the methods of our grandfathers leave a sorry inheritance. The betterment of those methods and the question of soil improvement must not be left until farms and farmers are hopelessly poor.

### Advantage of Organic Matter in the Soil.

The advantages of having a good supply of organic matter in the soil for maize-growing are, in brief, all the advantages of a virgin soil over an old and long cultivated one. The organic matter—which may consist of any form of animal or vegetable matter—aerates the soil and opens it to the better ingress of rain, enables it to retain that moisture for a long time, largely prevents cracking and baking, and checks the leaching of soluble plant food material—especially nitrates. It also prevents in part the washing of soil on a hill slope, helps to render insoluble plant food material available, and itself supplies this material in a form readily assimilable by plants.

Every practical farmer has doubtless seen the rejuvenating effect of several years of grass pasture or a perennial crop such as lucerne. This is chiefly due to the accumulation of a vast quantity of roots which permeate the soil, and which on decaying increase its content of organic matter or humus. Other things being equal, the greater the amount of organic matter in the soil the richer is the soil in nitrogen, which, as will be seen later, is the most expensive element of plant food, and which is removed from the soil by the maize crop in largest quantity. Most of our maize soils contain amounts of potash sufficiently large to grow hundreds of maize crops without seriously depleting the total supply, but much of this potash is held in insoluble compounds which the plants cannot make use of, but of which the potash is made available by the action of decaying organic matter. Hence the addition of organic matter supplies the soil with the two most costly of the important plant food elements in easily available form.

On many maize farms stable or animal manure is the most valuable form of organic matter which is readily procurable; it is not made so much use of as it deserves for maize-growing. (The value of green manures in supplying organic matter to the soil will be discussed later.)

In some of the wheat districts of the State where maize is also grown, the application of straw (which is often burnt after being saved for a few years) should also be considered for supplying organic matter to the soil. Compared with animal manure, straw contains about the same amounts of nitrogen and phosphorus and is much richer in potash. Though the plant food materials are not in soluble form and straw does not give as immediate results as animal manure, it is even more lasting in effect. In districts where it is likely to be available, large quantities should not be used per acre, for it is preferable as a top-dressing, as it saves more moisture when used in this way. In these districts moisture is most often the limiting factor, and much undecomposed vegetable matter in the soil interferes seriously with the plants' supply of it. For this reason also, the use of straw as a top-dressing might be more advisable in these districts than the growing of green manuring crops unless the land is subsequently fallowed, as such crops make a considerable demand upon the soil's supply of moisture. The same precautions apply to the application of stable or animal manure in dry districts. In America, straw and manure spreading machines are regularly in use in many States. The method usually employed with straw is a light application or top-dressing on the young wheat crop during the winter, or on the young maize crop during the spring. This also does good service as a mulch for preventing evaporation.

In those districts where wheat and maize are grown, the practice of seeding wheat directly after the maize crop without burning or ploughing the maize stalks under, but by simply fitting the land with a disc cultivation and keeping these stalks on the surface, is one that should be given consideration. If the season turns out dry the maize stalks will be of more benefit and do less harm on top of the soil than underneath, where they do not rot and where they create large air spaces which dry out the soil very quickly.

### Stable or Animal Manure.

This term may be taken to include all forms of animal excreta (from horses, cattle, pigs, sheep and poultry). Visitors to a comparatively new country like Australia from some of the older settled countries are surprised at the tremendous waste of animal manure which they see going on here. Of course, we do not winter-house our stock here as is done in colder countries; but it has to be conceded that these animals are kept during some part of the day in a confined space from which the manure has to be shifted or handled in some way at least, for the sake of cleanliness. It is calculated that on the coast alone, if only 5 per cent. of the total manure produced annually could be recovered, there would be over 300,000 tons which could be used directly! This would enable an application of 8 tons per acre every four years to be given on 150,000 acres—the approximate area cropped to maize in New South Wales.

Only about one-tenth of this amount is used in the production of vegetables near the large centres of population, and it is true that on the farm much more of the manure produced could be profitably used in producing vegetables for the farm home. Even so, it is reckoned that there would be a good surplus of manure for the maize crop on most farms, with only ordinary provision for collecting and saving it.

On a large scale there is no other field crop but maize (apart from vegetables) which can readily and profitably make use of this manure. Apart from the organic matter which is supplied in animal manure, it contains appreciable amounts of nitrogen and potash, which are at all times (and especially so at present) the most costly elements purchased in fertilisers. A knowledge of this fact will enable the farmer to effect considerable saving in his fertiliser bill when purchasing any of the commercial plant foods.

The average amounts of the three chief fertilising elements in the solid fresh manures of different animals are as follows:—

TABLE showing the approximate Amounts of Fertilising Ingredients in 1 ton of solid fresh manure from different animals.

| Animal. | Nitrogen. | Phosphoric Acid. | Potash. |
|---|---|---|---|
| | lb. | lb. | lb. |
| Horse (without litter) ... ... | 10 | 6 | 8 |
| ,, (with litter) ... .. ... | 12 | 5 | 12 |
| Cow ... ... ... ... ... | 8 | 4 | 6 |
| Pig .. ... ... ... ... | 12 | 9 | 6 |
| Sheep ... ... ... ... | 12 | 9 | 9 |
| Poultry ... ... ... ... | 15 | 15 | 10 |

TABLE showing the approximate Annual Production of Fertilising Ingredients of different animals.

| Animal. | Manure per year. | Nitrogen per year. | Phosphoric acid per year. | Potash per year. |
|---|---|---|---|---|
| Horse ... | 10 tons | 100 lb. | 60 lb. | 80 lb. |
| Cow ... ... | 9 ,, | 72 ,, | 36 ,, | 54 ,, |
| Pig ... ... | 1 ton | 12 ,, | 9 ,, | 6 ,, |
| Sheep ... | ¼ ,, | 3 ,, | 2¼ ,, | 2¼ ,, |
| 100 Poultry... | 2 tons | 30 ,, | 30 ,, | 20 ,, |

Owing to the conditions obtaining on most farms in the State where maize is grown, it is difficult to obtain readily large amounts of the manure of any stock, owing to their not being winter-housed, but the foregoing figures will give an idea of the value of animal manure if it is in any way procurable. For instance, a weekly gathering of manure from stables, cow-bails, small yards, pig-houses, and small runs on the average farm should result in the collection of ½ to 1 ton of animal manure (chiefly from horses, cows and pigs), which could be directly spread on the land or stored until winter. There is

an opinion amongst some farmers that cow manure is of little value. True, it is not as rich in the elements of fertility as the manure of other stock, but that fact does not make sufficient excuse for the large amounts which are allowed to go to waste on the average dairy farm, where some cultivation is done.

It is readily allowed that soiling fodder crops (especially lucerne) continually on grass paddocks, will build up the fertility of the land on the dairy farm more rapidly than any other means under our conditions, if these paddocks are in turn made into cultivation paddocks by definite rotation. Every cow will produce an average of 9 tons of manure annually, and soiling crops to stock on pasture will restore the humus and fertility much more quickly than pasture alone. The writer has seen crops of 100 to 120 bushels of maize per acre, produced on land which has been built up by pasture, together with the manure of cattle to which lucerne (green or hay) has been fed on the pasture. This land had been previously "worn out" by continuous maize-growing without dairying, until its production was only 40 bushels per acre. The combination of dairying with maize-growing is generally resorted to as the quickest means of restoring lost fertility on an old maize farm. This change to mixed farming on the Macleay and Clarence Rivers (which are the largest and among the oldest maize districts), is yearly becoming more pronounced. It is evidenced in the diminishing area under maize for grain in those districts, but it may be reckoned as a good sign, in so far that it means an increased average yield of maize per acre, owing to the increased fertility of the soil.

The value of lucerne or clover and grass pasture, in combination with animal manure, as a means of rapidly restoring lost soil fertility, will be dealt with more fully later; it is to the virtues of horse, cow and pig manure—so readily procurable on most dairy farms, because it has to be handled for sanitary reasons—that it is at this point desired to draw attention, and to the part it can be made to play in the production of immediate and lasting increased maize yields. From the figures given it will be seen that it should be possible to obtain, fairly readily, at least 50 tons per year of horse, cow and pig manure on the average maize and dairy farm on the coast. The comparison of the fertility elements in this amount of manure with those in artificial fertilisers may be made thus:—

It contains nitrogen equivalent to 1 ton of sulphate of ammonia.
,, phosphoric acid ,, ¾ ,, superphosphate.
,, potash ,, ¼ ,, sulphate of potash.

The total cost of these amounts of commercial fertilisers at the present time would be about £30. Allowing also for the value of the organic matter in the animal manure and the increased crop yields obtained, the value of such manure should be £50 or more. The value of cow manure from *purchased* foods like bran, pollard, lucerne hay, linseed meal, &c.—which are, unfortunately, largely fed during droughts and bad winters, instead of conserved fodder and farm-grown concentrates—is even much greater than these figures indicate. During these times and while this system of feeding is continued, it should be remembered that approximately

75 per cent. of the fertility elements in these foods can be recovered in the manure, which can under careful management be made to considerably reduce the ultimate cost of these high-priced feeds.

As already indicated, the large amount of organic matter in animal manure contributes much to its value, particularly for the maize crop. It is now known, too, that maize is one of the few crops which can make use of organic nitrogen and ammonia compounds directly as plant food, without waiting for their entire conversion into nitrates. No definite data can be obtained for the actual increase in yield of maize for the application of animal manure in this State, but almost every farmer has seen the effect in increased growth and yield on land where some manure has been spread—and has noticed also the lasting effect of this manure in the soil.

An application of 13½ tons manure per acre in the winter of 1900, without any further application, is recorded to have given the following results with maize in Oklahoma*:—

| Year. | Manured Crop. Bus. per acre. | Unmanured Crop. Bus. per acre. |
|---|---|---|
| 1900 ... ... | 17·27 | 18·92 |
| 1903 ... ... | 37·22 | 17·48 |
| 1906 ... ... | 54·06 | 42·59 |

These figures show the lasting effect of farmyard manure. In America farmyard manure is usually applied on clover sod or pastures, just before ploughing under for maize in rotations of three or more years. It is fully recognised there that maize is better than other cereal crops to follow closely the ploughing under of organic matter of any kind, especially if grain is to be harvested. When large amounts of fresh organic matter are present in the soil it has been found that maize, potatoes and peas are considerably better than other crops for making use of the slowly decomposing organic matter. On the dairy or mixed farm it would, therefore, be well to consider the advisability of concreting the cowyard, where the cattle stand for hours waiting their milking turn, instead of allowing them to stand knee-deep in fertility—literally trampling sovereigns into the ground and taxing the patience and endurance of the bail-hands as they slush through the mire to bail the cows. This concreted yard should slope downwards from the bails and end in a shallow gutter for catching the liquid manure, which contains nitrogen and potash in large amounts.

When the weather permits of the operation, increased use can be made of cow manure on the dairy farm by feeding stock with purchased foods or soiling crops on cultivation land. There is less loss of manure's fertility elements by this method than by any other method of applying manure. It has been calculated that there is a loss of 35 per cent. nitrogen, 22 per cent. phosphoric acid and 51 per cent. potash from fresh manure after three months' exposure.† On cultivation or pasture this loss does not take place, as these

* Oklahoma Expt. Sta. Bull. 87 (1910).

† Ohio Agr. Expt. Sta. Mon. Bull., Vol. 1, No. 5 (May, 1916).

plant food materials are washed into the soil and largely fixed there. To put this system into practice only involves the use of subdivision, or smaller paddocks instead of the one or two large cultivation paddocks that are usually found, and this would also naturally lead to definite rotation systems being adopted. On farms where this system is followed, both farms and farmers have become enriched as a direct result, while the risk of failure of both pasture and crops during drought has been minimised.

(*To be continued.*)

## Suggested Variation in Spray Formula.

Desiring to use the resin and oil spray recommended by the Department for citrus scale, and hearing locally that the fish oil might be omitted from the formula without diminishing its value, a Leeton orchardist addressed the following questions to the Under Secretary and Director:—(1) May the oil be omitted; (2) will an addition of resin or coconut oil or tallow make as effective a spray; (3) if so, how much more coconut oil, tallow or resin must be added to take up caustic; and (4) may the wash be a little caustic?

The correspondent was replied to as follows:—The oil may be omitted, but recent tests have proved that when the 3 pints of oil (or 4 lb. of common soap in place of the oil) were included more satisfactory results were obtained than in cases where resin and soda only were used. Regarding the addition of tallow or coconut oil, it is thought that this would probably be satisfactory, but such has not been actually tried by this Department. As already indicated, however, the substitution of 4 lb. of soap for 3 pints of fish oil has given equally good results. Two pints and 4 fluid ounces (or 2·54 lb.) of coconut oil, or 3·25 lb. of tallow, would be equivalent to the 3 pints of fish oil prescribed in the original formula.

Concerning the final query, it may be pointed out that, as a matter of fact, the wash according to this Department's formula is caustic, as an excess of soda is allowed for in view of the fact that resins vary in the quantity of soda necessary to emulsify them. Such excess, however, is not sufficient to harm trees, and is probably helpful in dealing with such scales as "white wax."

The Fruit Expert states that he has reason to believe that there is a risk in having an excess of resin, as, in trying out a formula lately in which the soda was insufficient to emulsify the resin, severe burning of foliage and wood resulted. When the total amount of oil is so small, probably the free oil would not prove very harmful, though it should be remembered that "free oil" means "waste oil."

So far as co-operative methods and principles apply to the marketing of fruit, the major causes of failure are—first, lack of a keen realisation by the members of the need of organisation; second, disloyalty to the association; and third, the absence of salesmanship ability in the management.—C. W. Baxter, Fruit Commissioner, in the *Agricultural Gazette of Canada*.

# Temporary Removal of Bees to Better Districts.

W. A. GOODACRE, Senior Apiary Inspector.

LAST season generally was a trying one for the apiarist, and in many cases there were serious losses during the spring. In other localities, apiarists have made progress in spite of the abnormal drought, and have been able to harvest a good surplus. The prospects for the coming autumn in some localities are not bright, owing to the drought conditions having had their effect on the flora during the budding period.

It seems to me that it would be wise, especially with the apiarist working in a commercial way, to consider the prospects of his locality and whether it would be to his advantage to remove the majority of his bees for a time to a locality likely to offer a better honey flow. As far as New South Wales is concerned, in bee-keeping the greatest problem that we have to face is the after-effects of an abnormal drought; and after the past season's experience, apiarists working in a commercial way will be wise if they make a study of localities to which bees could be removed and carried over a desired period. In most cases it will require more energy than expense, and probably the apiarist will be repaid even during the time that the bees are in a new locality. The grazier has to find fresh fields for his stock at times, but the apiarist is much inclined to trust to chance during somewhat similar times, even though a locality offers no prospects for colonies wintering well.

The coastal districts between Fassifern and Hornsby, and on the Illawarra line, as well as some of the localities near Sydney, are at the present time a picture with bloom. From personal observation and conversation with apiarists, I find the colonies are progressive, and in the majority of localities there were no losses last season nor during this spring. The coastal districts, although not recommended for the production of honey, are considered good for breeding purposes generally, and this is especially noticeable during abnormal times inland. For the apiarist who has no prospects in his locality for this autumn, and who desires to minimise the risk of losses, I believe that it would pay to remove bees for a time to localities that are favourable for breeding purposes.

Moreover, it would probably pay apiarists to investigate localities in coastal districts when their own localities offer no autumn prospects. They would probably find there are localities similar to their own that are valued for breeding purposes, in which stocks could be carried over a critical period. The apiarist would rarely be called upon to remove his bees as mentioned; but for the bee-keeper and for the bee-keeping industry in general a great deal could be done by the investigation of localities that would give relief and offer prospects of building up and wintering successfully. In many cases it would only mean one day's train journey for the bees, and probably only three visits to the locality by the apiarist.

# Farmers' Experiment Plots.

## Potato Experiments, 1918–19.

### New England District.

R. W. McDIARMID, Inspector of Agriculture.

THE potato experiments established in the New England districts last season were located with the undermentioned farmers:—

L. M. Rixon, Uralla.
R. A. Bell, Dumaresq.
Jas. Piper, junior, Llangothlin.
Theo. Farlow, Red Range.
J. F. Chick, Tenterfield.

The experiments comprised variety trials and manurial trials in each district. The former were uniformly fertilised with superphosphate at 2 cwt. per acre, while the manurial trials (with the exception of Dumaresq) were put down with the Manhattan variety. At the Dumaresq plots, Queen of the Valley potatoes were used.

The season was rather too dry in most New England localities for potatoes; this was mostly in evidence at Dumaresq, Uralla, and Llangothlin. At Red Range the season was dry for early sown potatoes, but December sown potatoes responded well to the January and February falls. This was also noticeable at Tenterfield. Indeed, had all the experiments been sown in December they would have yielded probably double the amounts. The Llangothlin district promised exceptionally good potato crops until flowering time when the dry weather beat the crops.

#### Soil and Cultural Details.

*Uralla.*—The plots here were in granite country, the land having been sown to wheat and oats the previous year. The stubble was ploughed under in January, and re-ploughed in September. Sowing was done on 9th October, and the land harrowed immediately afterwards to conserve the already scanty amount of moisture. The seed used was mostly cut, and, on account of the dry year, the germination was naturally not good. Strictly speaking, the yields are not truly representative of each variety, as the amount of cut seed varied with each.

The rows were 3 feet apart, and sets 18 inches apart in the drills. During the growing period the land was well worked between the rows, and hilling completed by 12th December. The rainfall from planting until harvesting amounted to 12 inches, but the dry month of December caught the crop at its critical stage and materially reduced the yields.

*Dumaresq.*—The land here was very similar to that at Uralla, being of a granite origin; it was cropped to oats in the autumn, and these were ploughed under to plant the potatoes. The crop in 1917 was oats for hay, the stubble from which was ploughed under. Sowing took place on 30th November, and the land was immediately harrowed to save moisture. Cut seed was used here also, and an indifferent germination resulted. Thus the results in this case also are not strictly comparable, or the individual yields truly representative of each variety.

The drills were 33 inches apart, with the sets 22 inches apart in the drills, and 5 inches deep. The growing crop was well cultivated and hilled about flowering time. The rainfall was not recorded at the plots, but that at the public school, some 2 miles away, is given as an indication of the dry season experienced in the district. The registration at the school was 6·22 inches from 1st November till 30th March; that at the plots would be about 5 inches for the same period.

*Llangothlin.*—The rich red volcanic soil which predominates in the district was chosen for the plots. It was cropped to potatoes the previous year, but they failed through too much wet weather. The land was ploughed in the autumn and left thus during the winter. It was worked again just prior to planting the plots. The plots were planted early in November, the ground being then in ideal condition.

The rows were 32 inches apart, and the sets 22 inches apart in the drills, and covered 5 inches deep. Cut seed was used, but with bad results. The germination was not good, Manhattan and Surprise being the worst. The rainfall was not recorded near the plots, but was generally deficient and patchy throughout the whole of the growing season. At flowering time good yields were expected everywhere, but the rains did not eventuate—and neither did the potatoes.

*Red Range.*—The land here was cropped to oats for hay in 1917, ploughed in March, and again in July, and cultivated the day prior to planting. Owing to Mr. Farlow's unavoidable absence from home, the sowing was delayed until the middle of December. The seed then had deteriorated considerably, and only whole seed was used.

The rows were 3 feet apart, and the sets were dropped every 18 inches in the drills and covered 4 to 5 inches deep. Unfortunately, the strike was not good, except with Coronation. The rainfall suited the season of sowing, and had the germination been good record yields would have been harvested. The quality was the best and stated to be equal to anything ever grown in the district.

*Tenterfield.*—The plots here were on the usual granitic soil, which had been cropped with wheat for hay in 1917; it was fertilised with 1 cwt. superphosphate per acre when sown to that crop. The stubble was ploughed under in September, harrowed a week later, and cultivated in the middle of October. The potatoes were ploughed in early in November, and were left unharrowed. The seed used was mostly cut seed, and consequently there were plenty of

"misses" to interfere with the results. The yields are really more in accordance with the germination than the variety. The rainfall here was better than the other districts, but a severe dry spell in January greatly affected the formation of tubers, and the good rains subsequently resulted in a fair amount of second growth.

RAINFALL during the Growing Period.

| | Uralla. | Dumaresq. | Tenterfield. |
|---|---|---|---|
| 1918. | points. | points. | points. |
| October ... ... | 735 | ... | ... |
| November ... ... | 238 | ... | 130 |
| December ... ... | 123 | 25 | 431 |
| 1919. | | | |
| January ... ... | 354 | 257 | 187 |
| February ... ... | 158 | 165 | 680 |
| March ... ... ... | 192 | 175 | 455 |
| Total inches ... | 12·00 | 6·22 | 18·83 |

PROPORTION of Waste Potatoes of different varieties at Tenterfield.

| Variety. | Marketable and Seed Potatoes, per plot. | | | Waste, per plot. | | | Waste, per acre. | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | c. | q. | lb. | c. | q. | lb. | t. | c. | q. | lb. |
| Surprise ... ... ... | 11 | 1 | 0 | 0 | 3 | 0 | 0 | 7 | 2 | 0 |
| Early Manistee ... ... | 8 | 1 | 0 | 0 | 3 | 0 | 0 | 7 | 2 | 0 |
| Carman ... ... ... | 10 | 2 | 0 | 1 | 0 | 0 | 0 | 10 | 0 | 0 |
| Factor ... ... ... | 11 | 0 | 0 | 1 | 1 | 0 | 0 | 12 | 2 | 0 |
| Brownell's Beauty... ... | 11 | 0 | 0 | 1 | 1 | 0 | 0 | 12 | 2 | 0 |
| Queen of the Valley ... | 11 | 1 | 0 | 1 | 2 | 0 | 0 | 15 | 0 | 0 |
| Manhattan ... ... ... | 9 | 3 | 14 | 1 | 3 | 0 | 0 | 17 | 2 | 0 |
| Magnum Bonum ... ... | 9 | 0 | 14 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| Coronation ... ... ... | 9 | 0 | 0 | 3 | 0 | 0 | 1 | 10 | 0 | 0 |

RESULTS of Variety Trials.

| Variety. | Uralla. | | | | | Dumaresq. | | | | | Red Range. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Germination. | Yield per Acre. | | | | Germination. | Yield per Acre. | | | | Germination. | Yield per Acre. | | | |
| | | t. | c. | q. | lb. | | t. | c. | q. | lb. | | t. | c. | q. | lb. |
| Factor .. .. .. | Very good | 3 | 18 | 3 | 2 | Fair .. | 2 | 19 | 0 | 25 | Bad .. | 6 | 12 | 2 | 10 |
| Queen of the Valley .. | Good | 3 | 0 | 0 | 0 | Good .. | 2 | 18 | 3 | 23 | ...... | ...... | | | |
| Magnum Bonum .. | Very good | 2 | 5 | 3 | 6 | ...... | ...... | | | | Very bad.. | 6 | 12 | 0 | 0 |
| Brownell's Beauty .. | Good .. | 2 | 4 | 0 | 22 | ...... | ...... | | | | ........ | 4 | 19 | 0 | 0 |
| Early Manistee .. | Fair | 1 | 18 | 1 | 11 | ...... | ...... | | | | Failed .. | Failed. | | | |
| Surprise .. .. | Fair .. | 1 | 17 | 3 | 22 | Bad .. | 2 | 8 | 0 | 14 | Failed .. | Failed. | | | |
| Carman .. . .. | Fair .. | 1 | 17 | 2 | 20 | Fair .. | 3 | 9 | 0 | 0 | Very bad.. | 4 | 19 | 0 | 0 |
| Manhattan .. .. | Good .. | 1 | 11 | 1 | 25 | ...... | ...... | | | | ...... | 4 | 8 | 3 | 26 |
| Dalhousie .. .. | Good .. | 1 | 19 | 1 | 24 | ...... | ...... | | | | ...... | ...... | | | |
| Sussex . .. .. | Good .. | 1 | 9 | 0 | 22 | ...... | ...... | | | | ...... | ...... | | | |
| Coronation .. .. | Bad .. | 1 | 0 | 0 | 10 | Very bad.. | 1 | 2 | 3 | 18 | Good .. | 11 | 9 | 0 | 26 |
| Satisfaction .. .. | ...... | ...... | | | | Good .. | 2 | 15 | 0 | 22 | ...... | ...... | | | |

### RESULTS of Variety Trials—*continued.*

| Variety. | Llangothlin. | | Tenterfield. | |
|---|---|---|---|---|
| | Germination. | Yield per Acre. | Germination. | Yield per Acre. |
| | | t. c. q. lb. | | t. c. q. lb. |
| Factor .. .. .. | Bad .. .. | 2 8 1 0 | Fair .. .. | 5 10 0 0 |
| Queen of the Valley .. | Bad .. .. | 2 4 0 0 | Fair .. .. | 5 12 2 0 |
| Magnum Bonum .. | Bad .. .. | 2 5 0 0 | Fair .. .. | 4 11 1 0 |
| Brownell's Beauty .. | Bad .. .. | 2 7 3 0 | Very good .. | 5 10 0 0 |
| Early Manistee .. | Bad .. .. | 1 14 2 0 | Good.. .. | 4 2 2 0 |
| Surprise .. .. | Very bad .. | 1 4 2 0 | Good.. .. | 5 12 2 0 |
| Carman .. .. .. | Bad .. .. | 1 18 0 0 | Fair .. .. | 5 5 0 0 |
| Manhattan .. .. | Very bad .. | 2 3 2 0 | Good.. .. | 4 6 2 15 |
| Dalhouise .. .. | ...... | ........ | ...... | ...... |
| Sussex .. .. .. | ...... | ........ | ...... | ...... |
| Coronation .. .. | Bad .. .. | 2 3 1 0 | Good.. .. | 4 10 0 0 |
| Satisfaction .. .. | ...... | ........ | ...... | ..... |

### RESULTS of Fertiliser Trials.

| Fertiliser per Acre.* | Uralla. | Dumaresq. | Red Range. | Llangothlin. | Tenterfield. |
|---|---|---|---|---|---|
| | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. |
| No manure .. .. .. .. | 2 2 1 23 | 2 4 0 7 | 3 0 2 22 | 1 18 0 0 | 4 7 2 0 |
| Basic superphosphate 2 cwt. per acre .. .. .. .. | 1 10 1 9 | 2 15 2 2 | 3 17 0 22 | ........ | 3 17 2 0 |
| Superphosphate, 2 cwt. per acre | 1 11 1 25 | 2 18 3 23 | 4 8 3 26 | 2 3 2 0 | 4 6 2 18 |
| P7 Mixture, at 3 cwt. per acre . | 2 6 0 8 | 2 16 1 11 | 3 14 1 0 | 2 0 3 0 | 5 2 2 0 |
| P5 Mixture, at 2½ cwt. per acre .. | 2 5 3 6 | 3 2 0 21 | 4 3 2 20 | 2 4 2 0 | 5 0 0 0 |
| P8 Mixture, at 3 cwt. per acre .. | 2 2 2 10 | 3 1 1 23 | 4 7 3 4 | 2 7 0 0 | 4 18 3 0 |

* The cost of the fertilisers mentioned (with composition indicated in parentheses) is as follows:—Superphosphate, 5s. per cwt.; basic superphosphate, 6s. 6d. per cwt.; P5 mixture (superphosphate 4 parts, sulphate of potash 1 part), 7s. 6d. per cwt.; P7 mixture (superphosphate and bonedust equal parts), 7s. 6d. per cwt.; P8 mixture (superphosphate 6 parts, sulphate of potash 2 parts, bonedust 2 parts), 10s. per cwt.

### RELATIVE Value of Different Fertilisers.

| Fertiliser per Acre. | Cost of Fertiliser per Acre. | Average Yield per Acre, all Districts. | Average Increase in Yield per Acre. | Value of Average Increased Yields at £6 per ton.* | Profit per Acre due to Fertilisers. |
|---|---|---|---|---|---|
| | s. d. | t. c. q. lb. | c. q. lb. | £ s. d. | £ s. d. |
| No manure .. .. .. .. | .... | 2 14 2 5 | ........ | ........ | ........ |
| Basic superphosphate, 2 cwt. per acre.. .. .. .. .. | 13 0 | 3 0 0 15 | 6 2 10 | 1 19 0 | 1 6 0 |
| Superphosphate, 2 cwt. per acre .. | 10 0 | 3 1 3 18 | 7 1 13 | 2 3 6 | 1 13 6 |
| P7 Mixture, at 3 cwt. per acre .. | 22 6 | 3 5 0 20 | 10 2 15 | 3 3 0 | 2 0 6 |
| P5 Mixture, at 2½ cwt. per acre .. | 18 6 | 3 7 0 9 | 12 2 14 | 3 15 0 | 2 16 6 |
| P8 Mixture, at 3 cwt. per acre .. | 30 0 | 3 7 1 7 | 12 3 2 | 3 16 6 | 2 6 6 |

* The valuation of £6 per ton was taken hypothetically. The potatoes actually sold at from £10 to £20 per ton, so that the profits were really much larger.

## Conclusions.

The results show clearly the value of artificial fertilisers, particularly when moisture was present. They also demonstrate the importance of whole seed for these experiments, as in every case the yields were more in accordance with the germination than the variety or the fertilisers used. The influence of the season is also very marked in regard to the time of planting.

The value of a green manure is also indicated at Dumaresq, where fed-off oats were ploughed under as the potatoes were planted. The rainfall here was very low, but the yields were above Uralla, and Llangothlin with a better rainfall. The planting was later at Dumaresq, so that also must be considered. Arrangements have been made here to precede potatoes with two years to sweet clover and rye grass.

## South-western Slopes.

G. C. SPARKS, Acting Inspector of Agriculture.

In carrying out last season's potato experiments in this district, the Department had the co-operation of Messrs. E. M. Herring, "Sheen," Batlow, and H. and R. Heinecke, Tumbarumba. Adverse weather conditions caused total crop failure at Tumbarumba; but while the Batlow plots suffered severely from the sustained dryness, the autumn rain came in time to ensure satisfactory yields.

At Batlow the plots were on virgin basalt soil, typical of the soils of the district. The land was ploughed in March, twice cultivated with spading harrow, harrowed, and sets ploughed in on 28th November, the rows being 36 inches apart, and the sets 15 inches apart. The variety trial was manured with 3 cwt. of P7 mixture per acre. The effective rainfall was 12·29 inches.

Results of Variety Trials at Batlow.

| Variety. | Marketable. | | | | Small. | | | | Percentage marketable. |
|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t | c. | q | lb. | |
| Up-to-Date ... ... | 7 | 2 | 3 | 20 | 0 | 14 | 2 | 20 | 90·6 |
| Coronation ... ... | 5 | 13 | 2 | 8 | 1 | 1 | 1 | 8 | 78·03 |
| Factor ... ... ... | 5 | 1 | 1 | 0 | 0 | 14 | 3 | 4 | 88 18 |
| Brownell's Beauty ... | 4 | 17 | 0 | 8 | 1 | 2 | 3 | 8 | 80 9 |
| Carman No. 1 ... ... | 4 | 13 | 0 | 24 | 0 | 8 | 2 | 8 | 91 5 |
| Early Vermont ... | 2 | 19 | 3 | 4 | 0 | 19 | 2 | 0 | 75·4 |
| Early Manistee ... | 2 | 19 | 1 | 16 | 0 | 11 | 3 | 16 | 80·59 |

The season was particularly unfavourable for early varieties, as they were compelled to complete their growing period under distinctly hostile conditions, whereas the late maturers were enabled to develop under circumstances much more favourable. The results of previous experiment in this locality would seem to indicate that very early varieties are unlikely to prove successful under normal weather conditions. This experiment tends to increase the claims of Up-to-Date as a main crop variety for Batlow, where it has now been on trial for four seasons, and on each occasion has compared very favourably with Coronation (the local standard). It will be seen that this year Up-to-Date outyielded Coronation by upwards of 29 cwt. per acre, at the same time producing a much greater uniformity of tuber. Factor is another promising variety, also a white skin, and of admirable table quality.

The six plots used in the manurial trials at Batlow were sown with Coronation and comprised five manured plots and one unmanured.

RESULTS of Manurial Trials at Batlow.

| Manure and Cost per Acre. | Yield. | | | |
|---|---|---|---|---|
| | t. | c. | q. | lb. |
| P7, 3 cwt. (25s.) ... ... ... ... | 5 | 13 | 2 | 8 |
| P5, 2½ cwt. (21s.) ... ... ... ... | 5 | 10 | 0 | 4 |
| Superphosphate, 3 cwt. (18s.) ... ... | 4 | 11 | 2 | 12 |
| Basic superphosphate, 3 cwt. (21s.) ... | 4 | 9 | 1 | 24 |
| No manure ... ... ... ... ... | 4 | 7 | 1 | 20 |
| Superphosphate, 2 cwt. (12s.) ... ... | 3 | 18 | 0 | 24 |

It will be noted that the application of 3 cwt. of P7 gave an increase of 26 cwt. per acre against the unmanured plot, and at the ruling market rates for potatoes showed a profit of £21 per acre. This is a repetition of the 1917–18 success of this mixture, when it increased the yield by 23 cwt. per acre. The P5 mixture has invariably proved effective at Batlow, and on this occasion caused an increase of 21 cwt. per acre. It is very evident that the use of artificial manures can be expected to prove highly profitable in this district. Manurial trials have been in progress since 1912, and upon each occasion the manured plots have yielded much more heavily than the unmanured.

SPACING Trial at Batlow.

| Space between sets in drills. | Yield. | | | |
|---|---|---|---|---|
| | t. | c. | q. | lb. |
| 21 inches ... ... . | 5 | 12 | 3 | 8 |
| 18 ,, ... ... ... | 5 | 2 | 0 | 24 |
| 24 ,, ... ... ... | 5 | 0 | 1 | 4 |
| 15 ,, ... ... ... | 4 | 12 | 1 | 0 |
| 12 ,, ... ... ... | 4 | 11 | 1 | 4 |

The results of the spacing experiment—designed to determine the most profitable spacing between the sets in the drills—are this year in direct contradiction to those of past seasons. It will be seen that the 21-inch space gave the highest yield; in previous experiments the 12-inch and 15-inch spacings proved most profitable, and this year's figures are somewhat difficult of explanation. The most obvious reason for the above mentioned variation is that in a dry season like the past the additional root room afforded by the wider spacing might prove beneficial. Apart from this consideration, wide spacing is never to be recommended on account of the pronounced tendency to coarseness that is usually invited by it.

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"I HAVE found your Poultry Notes very helpful from time to time."—A Marrickville correspondent.

# Trefoil Dermatitis.

CHAS. L. O'GORMAN, M.R.C.V.S., Government Veterinary Officer.

THIS disease, although known in certain parts of New South Wales for a considerable number of years, may not be recognised by many farmers under the above name. It is manifested by an eruption of the skin, the parts suffering being those that are devoid of pigment. Horses are generally affected about the lips, nostrils, coronet or pasterns when these situations have white or pink markings; cattle are also affected about the lips, and any other parts where the coat is white. In sheep the lips, nostrils, face and ears are the common sites of the disease; and in shorn sheep the back and flanks become affected.

In slight cases there may be only redness, itching, swelling, and subsequent desquamation of the epidermis on the white portions of the skin. In more extreme cases, however, the skin, which is at first red, becomes swollen and covered with vesicles and pustules, which burst and discharge. In such cases the affected parts often become covered with crusts or scabs of dried exudate and blood, and very commonly—as a result of the animal biting, scratching, or rubbing the affected parts—large raw, excoriated surfaces are produced which may suppurate, or dry and become cracked and fissured. Necrosis and sloughing may follow as a result of infection of these wounds, and the loss of an ear is not an uncommon occurrence in sheep.

## Of Dietetic Origin.

In the absence of any definite knowledge as to its true nature, this disease was generally known as "aphis disease," the aphis being regarded as the cause, notwithstanding the fact that aphides were never found on the lesions.

Light was thrown on the subject by the investigations carried out by Dr. Dodd, D.V.Sc., F.R.C.V.S., a report by whom was published in 1916, which proved conclusively that the disease was not due to aphides, but was dietetic in origin, being caused by feeding mainly or exclusively upon the common trefoil (*Medicago denticulata*). It was found that feeding on trefoil rendered the skin very sensitive to the sun's rays; and when exposed to continual direct sunshine an erythematous dermatitis was produced on the pink or white portions of the skin, *i.e.*, on the unpigmented parts. Even in the unpigmented areas lesions do not occur if such areas are protected from the direct rays of the sun.

Three factors were found to be necessary for the production of this disease:—(1) The food must consist entirely or mainly of trefoil; (2) the animal must possess unpigmented skin; (3) such unpigmented skin must be exposed to the direct action of the sun's rays.

It is well known that certain plants produce a similar eruption of the skin—as, for instance, buckwheat, alsike clover, and red clover. A similar outbreak has also been recorded in horses working among growing potatoes. In liability to the disease, individual idiosyncrasy plays some part; all animals, though equally exposed, are not equally attacked. The white face, however, suffers more than the white legs, apparently because of its more constant exposure, the absence of shadow from the trunk, and the delicacy of the skin, and the fineness and thinness of the hair.

### Typical Predisposing Circumstances.

In an outbreak which occurred recently in the Dubbo district, the circumstances and symptoms were so typical, and so fully bear out the findings of Dr. Dodd, as to be of sufficient interest for brief description.

A flock of sheep (principally wethers) were brought up for shearing, at which time they were all perfectly healthy. After being shorn, they were divided into two lots, one of which was turned on to a pasture which consisted almost solely of trefoil, the other lot being placed in a paddock free from it. A week later, the wool on the sheep that were in the trefoil paddock began to peel off along the back and in patches on the sides, leaving the skin quite bare. Intense redness and tumification, with violent itching and rubbing, were evidenced, while in some cases vesicles with yellowish contents, sores and scabs appeared. Lesions also occurred on the ears, nostrils and around the mouth, though these were not so pronounced as those on the back. A striking contrast was afforded by a few black sheep in this lot, which, although shorn and under identical conditions as to feed and exposure to sunshine, remained quite unaffected, the pigmented skin of these black sheep accounting for their immunity.

An inspection of the sheep on the trefoil-free pasture showed that they had remained perfectly healthy. On removal of the affected sheep from the trefoil, recovery commenced, and in a fortnight's time a distinct growth of wool could be observed on the previously denuded parts.

## Farm Book-keeping.

Without accurate book-keeping no farmer can tell exactly how he stands or how much he has made or lost over any period. It may be argued that with the best kept accounts he cannot tell exactly how he stands, owing to variation in the standard of fertility of his farm or other factors, which can only be estimated. But he will know his exact financial position, and the financial results of his farming over a given period. The farmer's books show him whether his past management has been on the best lines, and by judging from results he can vary his present and future policy. For other reasons which need not be gone into in detail, *e.g.*, income tax questions, labour problems, &c., books are necessary to the present-day agriculturist. That he is aware of the fact is evident from the keen interest that is being taken in the question of farm accounts at the present moment.—*Journal of the Board of Agriculture*, England.

# New South Wales Choicest Butter.

## PERCENTAGE OF BUTTER-FAT AND WATER.

L. T. MACINNES, Dairy Expert.

IN connection with the testing of pure-bred dairy cows, under the United Pure-bred Dairy Cattle Breeders' Association's testing scheme, the standard for estimating commercial butter from butter-fat was last year fixed at 83 lb. of butter-fat in 100 lb. of commercial butter. In order to verify this ratio, and at the same time ascertain as accurately as possible under practical conditions the fat and water content of New South Wales choicest butter manufactured under the system of neutralising and pasteurising of cream before churning now generally adopted, I arranged to obtain samples during every month for a period commencing October, 1918, and ending September, 1919, from butter factories representing all the varied conditions under which butter is manufactured in this State. These samples were transmitted regularly to the Chemist's Branch of this Department for analysis, and the results of the analyses are now made available.

The samples were taken from the following butter factories :—Bega, Nowra, Goulburn, Singleton, Scone, Tamworth, Dungog Co-operative, Upper Manning River (Wingham), Manning River Co-operative Dairy Co., Macleay River (Kempsey), Upper Bellinger, Ulmarra, Casino, Kyogle Central, North Coast Co-operative Co. (Lismore), Foley Bros. (Lismore), Nimbin, Ballina, North Coast Co-operative Co. (Byron Bay and Murwillumbah), and Tweed River Butter Co.

In working out the average percentage of butter-fat and water for each month from the samples of choicest butter analysed, the actual output of choicest quality butter of each factory concerned was taken into account. This was also done in arriving at the average content for the whole year. The following table gives the total output of choicest quality butter of these twenty-one butter factories for each month of the period covered by the investigations, with the average fat and water percentage contained therein :—

| Month. | Choicest Butter. | Percentage of Butter Fat. | Percentage of Water. |
|---|---|---|---|
| | lb. | | |
| October, 1918 ... | 2,176,201 | 83·12 | 14·63 |
| November, ,, ... | 2,486,576 | 83·84 | 13·71 |
| December, ,, ... | 2,740,084 | 83·06 | 14·18 |
| January, 1919 ... | 2,347,860 | 83·24 | 14·18 |
| February, ,, ... | 1,665,691 | 83·84 | 13·71 |
| March, ,, ... | 2,549,445 | 83·42 | 14·09 |
| April, ,, ... | 2,685,655 | 83·28 | 14·17 |
| May, ,, ... | 2,557,110 | 82·91 | 14·19 |
| June, ,, .. | 1,935,037 | 82·97 | 14·4 |
| July, ,, ... | 1.428,319 | 83·35 | 14·78 |
| August, ,, ... | 1,173,070 | 83·9 | 13·92 |
| September, ,, ... | 1,230,797 | 83·28 | 14·26 |

In order to arrive at the average of the whole of the samples analysed during the twelve months, it was necessary to work out each month the pounds of fat and the pounds of water approximately contained in the amount of choicest butter for each individual factory for every month of the year, basing the calculations on the percentage of fat and water as disclosed by the analyses of the samples submitted. The total quantity of choicest quality butter represented by these analyses for the whole twelve months was 24,975,845 lb. *The average fat and water content, ascertained on the above lines, was* 83·32 *per cent. fat and* 14·14 *per cent. water.*

This is the most comprehensive series of analyses for fat and water undertaken by the Department. The amount of clerical labour involved in arriving at the true averages, based on the actual output for each month of every factory whose butter was analysed, was very great. The clerical work was carried out in the office of the Dairy Branch, and the analyses by Mr. A. A. Ramsay, Principal Assistant Chemist, at the Chemist Branch. The managers of all the factories whose butters were analysed have been supplied with details showing the analyses of their own butter for each month of the period during which the investigations took place.

It will be seen that, as the result of these analyses, the standard adopted for estimating butter in connection with the yields of dairy cattle is approximately correct. It will also be seen that the average moisture content is well within the standard laid down in the Dairy Industry Act (16 per cent.) and that the variation of both fat and water averages from month to month was very small.

## Poison Baits for White Ants.

There is still much to be learned regarding the resistant properties of different Australian timbers in relation to white ants. A poison bait generally considered effective may be made by the admixture of an ounce of arsenic to a pound of treacle, but I would recommend that arsenite of soda (a similar quantity), roughly one-third of which is arsenic, should be substituted for that ingredient. This should be dissolved in hot water and then mixed with the treacle.

The bait is poured into the woodwork of floors or joists which are not going to be removed, but which may be harbouring the ants; it percolates through any damaged wood and coats it with poison. A mixture of 1 oz. Paris green and 1 lb. pollard, brought to the consistency of putty by the addition of a little sweetened water, has also been found useful. This should be forced into the wood it is not desired to remove.—W. W. Froggatt, Government Entomologist.

The chief factor in the fertiliser position is that farmers cannot afford small crops on their arable land.—*Journal of the Board of Agriculture*, England.

# The Pruning of the Vine.

[Continued from Vol. XXX, page 808.]

H. E. LAFFER, Viticultural Expert.

## Treatment of Annual Growths.

*A spur* may be defined as a portion of the annual wood of the vine which has been cut back to a general length of two buds. In some cases three, or even four, buds are left, but such are an exception in the general treatment of the vine.

*A rod* is a portion of the annual growth which, mainly for purposes of fruit production, is cut back to a length greater than four buds and tied down by its extreme end to a wire or some portion of the vine.

By reason of the limited number of buds constituting a spur, the growth from each under normal conditions is strong, and capable of developing large bunches of fruit, as well as providing wood for re-establishing the spurs in the following year. The spur may thus be said to fill a dual purpose in providing both the fruit and the wood from which the framework of the vine is built up. Consequently, it will be readily understood that in selecting the spurs, all things being equal, the preference should be given to those which will maintain or improve the general contour of the vine. By reason of the limitation of the number of buds on a spur-pruned vine, it can naturally carry a greater number of secondary arms as compared with one which is rod-pruned. In fact, it may be said that the number of secondary arms is limited only by the vigour of the vine.

In the case of rod-pruned vines, the purpose of the rod is purely for fruit production, and therefore its position, in so far as it affects the shape of the vine, need not be considered. The rod is of only a temporary nature, and it is removed at the pruning subsequent to its having borne fruit.

In view of the numerous buds which have to be nourished, the individual growths are generally weak, and are therefore not suited to the purpose of renewing the fruiting wood. Apart from this fact, the canes upon fruiting rods are usually a long way from the permanent wood of the vine. Under these circumstances the use of these canes would lead to a badly constructed framework. In order to overcome this difficulty, the spur is used in conjunction with the rod. The former assures renewal of good strong canes, which may be used for the purpose of re-forming while the rod is carrying the fruit. With this object in view, it follows that the spur must be given preference of position in so far as it influences the shape of the vine. It is preferable to select a well-placed water shoot rather than a badly-placed fruit shoot. The rod, on the other hand, must be a fruit-bearing cane, and the question of its position on the vine does not matter so long as it yields the fruit. Under normal conditions of growth the spur and the rod will be created from the

two canes upon the previous year's spur, the lower one being made into the new spur, and the upper one the new rod. When the vine is wholly spur pruned, the spurs should always be fruit-bearing wood.

### Reasons for Rod and Spur Pruning.

There are several reasons for adopting this differential treatment in the annual pruning of the vine. The accumulated results of experience in vine pruning have demonstrated that whereas some varieties yield the best results from spur pruning, others again give more fruit if pruned with one or more rods.

In certain varieties the fruit-bearing wood is produced from practically any healthy bud upon a fruit-bearing cane. In these varieties, the reduction of the canes to short spurs assures a prolific fruiting. An extension of these spurs into rods would, under normal conditions of culture, result in over-production, with a consequent falling off in the quality of the fruit. Such varieties are generally large-bunched, as in the case of table grapes, and where quality is required there is no doubt that this system of pruning gives excellent returns. There are cases wherein the normal size of the bunch is small to medium, and although they will fruit very satisfactorily on the spur system, the maximum weight of fruit possible would be below the normal capabilities of a strong vine. Under conditions which are conducive to vigour, the use of rods in conjunction with spurs assures a much heavier crop. Such conditions are supplied by irrigation on very fertile soil with a good rainfall. The same object can be secured to a great extent by increasing the number of spurs to such an extent as to very materially increase the crop, but unless this can be accomplished without excessive crowding it is better to make use of some rods. On the other hand, when the vines are but normal to weak in their growth, the spur only should be used. This same rule applies in vines which are normally rod-pruned, but may become weakened from some reason or other. As a temporary expedient, the rods should be dispensed with for a year, in order to renew the strength of the canes upon the spurs.

There are other varieties which have a different habit of fruiting, and to which the spur system does not apply satisfactorily. In these cases the fruiting canes are developed from buds at some distance from the base of the cane, usually extending from about the fifth or sixth bud towards the extremity. It follows, then, that if the cane is suppressed to form a spur, there will be practically no crop of fruit. The pruning of these varieties necessitates the use of rods for fruit-production, and in general they range from six up to ten or twelve buds, according to the vigour of the vine.

In all cases the grower should have a knowledge of the habit of fruiting of his vines, and he should adopt the system of pruning to suit the conditions of soil and climate under which he may be working.

If table grapes are the objective, with few exceptions the spur system will prove the best, by reason of the more uniform size and quality of both bunches and berries.

Fig. 5.—A weak growing vine, spur pruned on two short main arms.

Fig. 6.—A strong vine, rod and spur pruned.

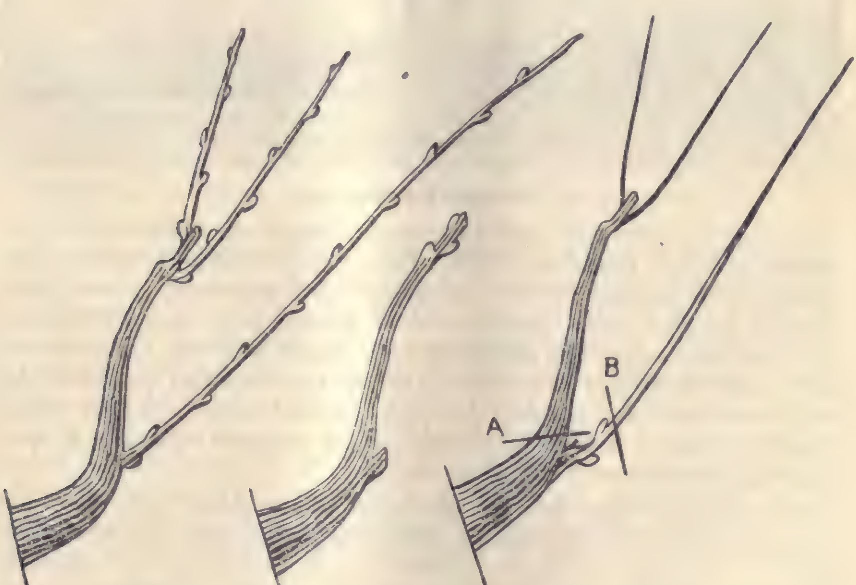



Fig. 7.—Diagramatic representation of a watershoot and its treatment in shortening back a secondary arm.

Some of the best known varieties grouped under the spur system of pruning are as follows:—Muscat Hamburgh, Black Hamburgh, Doradillo, Muscat Gordo Blanco, Muscat of Alexandria, Grand Turk, Duke of Buccleugh, Temperano, Trebbiano, Sweet Water (Palomeno), Palomeno Blanco, Lady's Finger, Black Malaga, Red Malaga, Red Prince, Santa Paula, Pedro Ximenes, Gros Colman, Trentham Black, Frontignac, Belas Blanco, Royal Ascot, Ulliade, Whortley Hall, Chasselas, Royal Muscadine.

The exceptions amongst table varieties are:—Waltham Cross, Daria (Ohanez), Sultana Centennial, Raisin des Dames, Cornichon, and Crystal. The above-mentioned varieties appear to yield more consistent crops if pruned with a proportion of rods.

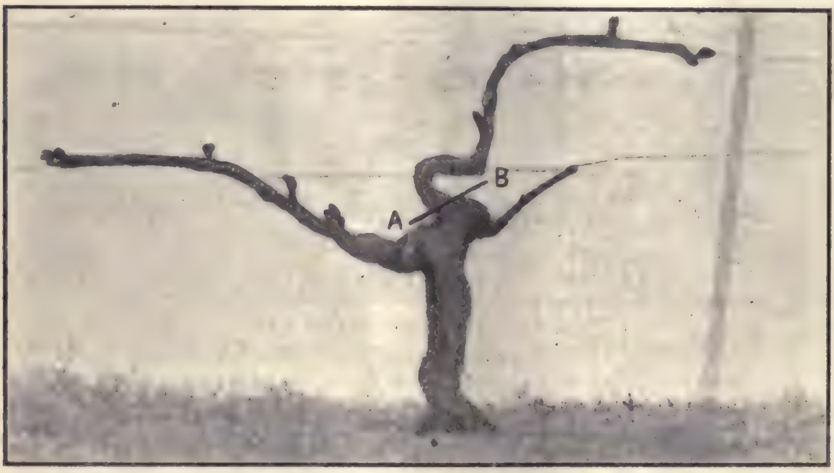



**Fig. 8.—A badly constructed arm, and the method of training a water shoot to replace it. Next year the old arm will be cut off at AB**

### Wine Varieties.

Amongst the varieties normally devoted to wine-making, Mataro, Grenache, Doradillo, White Hermitage, Pedro, Blanquette, Verdelho (Madeira), and Hunter River Riesling (Semillon), all respond to spur pruning. These vines, however, growing under conditions which develop great vigour, will return much heavier crops when pruned to the rod and spur. The same may be said of most of the spur pruned table varieties when size and quality of the individual bunch are sacrificed for the purpose of securing heavier crops. This can, of course, be safely undertaken where irrigation is possible, or upon soil which is more than ordinarily fertile.

Wine varieties which should always be rod pruned if full crops are to be secured, are the Riesling, Shiraz (Hermitage), Malbeck, Carbernet, and Sercial. One vine, the Zante Currant, may be placed in a class by itself, demanding treatment differing from all other varieties. By nature it is exceedingly vigorous, and in order to curb its rampant growth the vine was for many years heavily loaded with rods. Even then the setting of fruit was

most unsatisfactory. Subsequent to the general adoption of the practice of "cincturing," or "ring-barking," the non-setting habit has been overcome to such an extent that it is the common practice among currant-growers to totally spur prune the vine. A large number of spurs are left in order to secure a heavy crop. The cost of pruning is thus reduced and the operation simplified. The fruit at the same time is more uniform in quality. In successful commercial practice there is no system of pruning in which rods alone are left. Certain devices have been tried with a view to abolishing the spur, but in practice they all fail, no matter what their theoretical claims may be. As the rod is established solely for fruit production, it follows that a definite number of spurs in proportion to the rods are needed for renewals in the following year. To this end, the rule is to leave at least the same number of spurs as there are rods, but more generally the spurs exceed the rods in number.

**Fig. 9.—An old vine cut back through the stem showing several water shoots.**

The normal production of wood from a spur during the season will be two well developed canes; possibly, by reason of the base buds bursting, there may be more. In any case, having in view always the advisability of increasing or decreasing the number of secondary arms when seeking to renew the spur, one naturally selects the lowest suitable fruit-bearing cane, the rest being removed. When re-establishing a rod as well as the spur, it must be borne in mind that the rod must be fruit-bearing, and the new spur will be formed from the lower and the rod from the upper cane. As the spur need not in this case be fruit wood, it is preferable to use a well-placed water shoot rather than a badly-placed fruit shoot. In cases where only one fruit shoot is available, but where there are good water shoots in suitable positions, the rod is made from the fruiting cane and the spur from the water shoot. Should the choice be limited to one cane only, the rod must be temporarily abandoned in favour of the spur. Similarly, vines which are normally

rod-pruned will be reduced to spurs only should they become unduly weak from any cause. The rods are again replaced if ordinary vigour is regained.

Much depends upon the judgment of the pruner in maintaining the balance of vigour. By overloading the vine with fruit-bearing wood, it is possible to so reduce the general vigour of the growth that in the following year there is little wood strong enough to renew the rods. Such an error of judgment may be due to climatic factors, but in any case the results are the same. Should the error be noted soon enough—such as, for instance, during a particularly dry summer—a good deal may be done if it is possible to remove a proportion of the rods by, say, the end of November. This has been done in times of drought with good results. The same may occur when for some reason the setting of fruit has failed; then, having failed in their purpose, the rods may be removed if thought expedient. The only alternative upon a weakened vine is to temporarily suspend rod pruning until the normal vigour has been regained. This may be accomplished in one year, or it may take longer. It is impossible to lay down any rule as to the number of spurs and rods which vines generally may carry successfully, for the reason that so many outside factors are involved. The strength of the vine at time of pruning can only be gauged by the number and dimensions of the matured canes. Taking into consideration the amount of fruit-bearing wood carried in the previous year, the experienced pruner decides whether this should be increased or decreased. In all cases it is well to have a reserve on the side of the wood development, as it allows a margin for the possibility of a short rainfall. Apart from this, a vine which is working up to its maximum capacity of production every year will not last so long as one which makes more wood. The fruit from the more vigorous vine will surpass the weak one in quality, if not in quantity.

### Treatment of Water Shoots.

The water shoot is not an unmitigated evil; in moderation it indicates a reserve of energy on the right side, and is useful in many ways. An excessive number of water shoots may be attributed to several causes. In the case of normally developed vines they may be induced by a period of conditions more than usually favourable to growth. The usual channels for outlet, represented by the number of buds left upon the pruned vine, are insufficient, and consequently water shoots break out from the latent buds. Such conditions must not be taken as indicating the need for more liberal pruning, and it would be unwise to make any material departure from the usual treatment of the vine.

When numbers of water shoots arise under ordinary conditions it is an indication of one of two things—either that the vine is being pruned too severely or that, the older and permanent wood being worn out, the sap flow breaks out through latent buds in the form of water shoots. In the first case, excessive vigour is first indicated by the bursting of base buds upon the spurs, and the remedy is found by increasing the number of spurs or rods which a vine may be carrying. In the second it becomes necessary

to re-form the worn-out vines whose debilitated condition is indicated by very weak growth from spurs at the summit of the arms. Finally, we may find a number of water shoots forced out as the result of severe frost destroying the spring growth. This is an occurrence, fortunately rare, which implies a very short crop in the following year. There is no alternative but to use such fruit canes as may be available and re-form the vine from the water shoots. In all cases the surplus ones should be cut out as close as it is possible to get them. The remainder will be used as spurs in order to renew the portions killed by the frost.

A true water shoot—that is, one which arises from a latent bud upon old wood—is not fruit-bearing, but if cut back to a spur will produce canes which will develop fruit-bearing buds. In the succeeding pruning these canes may be used either as spurs or rods for fruit production. Their buds develop canes which will carry fruit, for the reason that they have behind them two consecutive seasons' growth. (See Fig. 7.)

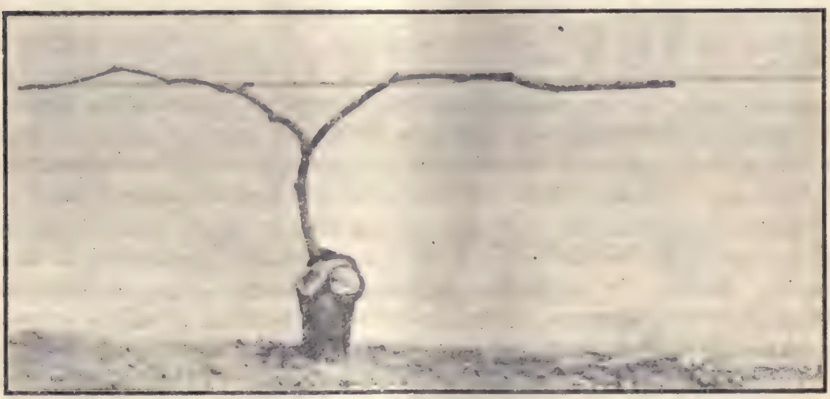


Fig. 10.—The same vine as in Fig. 9, pruned to form a new stem and main arms from one of the water shoots.

In all cases, superfluous water shoots should be cut off below the base buds. If this is not done, they tend to grow again from year to year, robbing the fruit wood of much valuable energy, and proving a source of additional cost in pruning. The best way to deal with all unnecessary growths is to rub them off during the spring while in a soft condition and easily broken out. Skilfully carried out, this practice will go a long way to reducing the cost of winter printing.

## Treatment of Secondary Arms.

It has been previously pointed out that one of the aims of pruning is to prevent undue lengthening of the secondary arms of a vine. It becomes only a matter of time, however, when the annual accumulations from the base of the spur place the fruit-bearing wood at the summits of long, bare arms. No matter what care is put into the treatment of these arms, there comes a time when the general vigour of growth is reduced by the distance

which the sap must travel and by the fact that its flow is more or less impeded by accumulations of scars created by pruning. It will always be found that the best results in quality of fruit will be secured when the wood producing it is vigorous and situated fairly close to the main branches. Apart from other objections, long secondary arms destroy the general symmetry of the vine and are more likely to be broken by teams during cultivation.

As a general rule, it will be found that the more fertile the soil, and given fair treatment, the longer will the secondary arms retain their vigour. It is not wise to unnecessarily interfere with the more permanent portions of the vine, and, so long as they retain their vigour and do not hamper cultural operations, there is little occasion to shorten back. It should be remembered that large scars, such as those induced by removal of arms, are best avoided as they may lead to troubles, such as dry rot and its other attendant evils, white ants, borers, &c. Under ordinary vineyard conditions, however, there comes a time when the vigour of the fruiting wood diminishes, either by undue multiplication of the secondary arms or by the interruption of sap-flow, already referred to. Oftentimes, old vines which appear almost beyond recovery may be renewed by timely treatment. In the first place, if there is obvious overcrowding of arms, the removal of a proportion will result in renewed vigour for the remainder. Such a course of treatment has another advantage in the fact that removal of a number of worn-out secondary arms will most likely give rise to the development of numerous water shoots at or about the points of removal. These will supply the best possible means of renewal.

In all cases where old vines are carrying long secondary arms, it will be found that strong water shoots arise from time to time at some points on their length. Having in view the fact that water shoots are not fruit-bearing, the long arm is not suppressed right away unless the terminal growth is so weak as to be quite useless for fruit-bearing in the following season.

The plan adopted is to cut the water shoot back to one bud, with a view to securing one strong cane in the following year. At the next pruning this cane will be carrying fruit-bearing buds, so that the old arm can safely be cut off, leaving a strong spur as the base of the new arm. In rod pruned varieties, where it is desired to replace a rod and spur, two buds will be left on the water shoot instead of one, in order to secure the two canes for re-forming. At the next pruning, the old arm can be cut away and a new spur and rod created from the two strong canes. (See Fig. 7.) One point which is too often neglected in renewal of arms is the smoothing over of the saw sections created by their removal. A rough section, as left by a saw, will not heal over, whereas if the surface is subsequently smoothed with a knife or secateurs, there is much more chance of its being absorbed by the developing tissue.

The vine responds to sympathetic treatment, and is not something which may be indiscriminately hacked about. In dealing with fully-formed and old vines, the experienced pruner, who should know the why and wherefore of his operations, looks two years ahead, assuring not only provision for the next crop, but renewal of worn-out wood in the seasons to come.

### Renewal of Main Arms and Stem.

Although the necessity for renewing these practically permanent portions of the vine is more remote than that of the secondary arms, the occasion does arise. Main arms can be replaced in the same manner as the secondary arms by establishing the base of a new arm from a suitably-placed water shoot. With trellised vines it may necessitate the use of a stout water shoot rod which will be trained along the wire to replace a worn-out or injured main arm. Upon this the secondary arms are afterwards built up. (See Fig. 8.)

Reconstruction of the whole vine by creating a new stem is the least likely, but, for various reasons, a possible necessity. Assuming that there is sufficient vigour in the root system to force out good water shoots low down upon the old stem, one of these can be utilised to re-create the framework of the vine. The growth from such a cane is very strong, as a rule, and until it becomes stout enough to support the weight of the young growth, should be securely staked or tied to a trellis wire. In either case the growth selected is cut back to such a height that its growth will serve to form the main arms of the new stem. From this point the whole structure of the vine has to be rebuilt step by step. (See Fig. 10.)

(*To be continued.*)

## Cement Necessary for 8,000-gallon Tank.

The following directions were supplied by the Works Overseer to a correspondent asking for particulars as to the quantity of cement necessary in the construction of an 8,000-gallon overground concrete tank :—

A tank 12 feet in diameter would be required, with an inside depth of 10 feet, the concrete 9 inches thick, and the reinforcement about 2 inches from the outer face, including the bottom. The joining of bottom and walls would need to be carefully done. The stone (preferably crushed) should not be larger than 1½ inches, and should be mixed with sharp, clean sand. Three bags of cement should be used to each cubic yard. The necessary quantity of cement (including that for facing the walls and bottom) would be sixty bags.

## Stamping Eggs for Cold Storage.

The practice of stamping eggs for purposes of advertisement or guarantee appears to be gaining favour with poultry farmers. Replying to a Seven Hills correspondent, who wished to know if the stamping of his eggs before they were put in cold storage would in any way harm them, the Poultry Expert wrote :—The only ill effect that could result from stamping eggs sent into cold storage would be from the ink running or smudging with moisture, thus making the eggs appear unsightly when they came out. Having in view the fact that eggs become moist on withdrawal from cold storage, the smaller the stamp and the less ink used the better.

# Notes on the Apple Root Weevil
## (*Leptops hopei*).

W. W. FROGGATT, F.L.S., Government Entomologist.

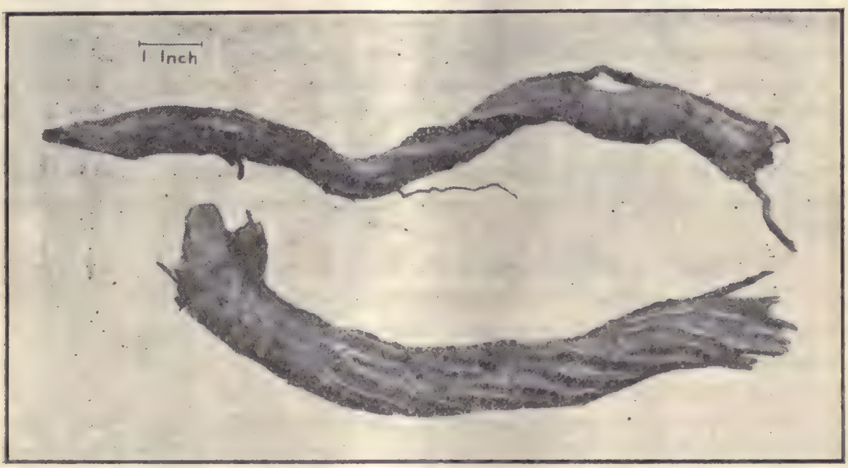
The circumstance that led to my further recent study of this curious weevil was the discovery by Inspector Gallard that a number of apple trees in the Epping district, which were being grubbed out by their owner on account of their unhealthy condition, were badly infested by its larvæ. Through the Inspector's kind offices I visited the affected orchard, when we were enabled to study the earliest stages of the life history of the beetle.

French, who first described the habits of this beetle as a serious apple-tree pest in Victoria ("Destructive Insects of Victoria, 1891"), gave it the popular name of the "apple root borer"—a rather misleading and unsuitable one, insofar as it does not bore into the stem or roots, but its larvæ, after working their way down the trunk, eat away the bark and gouge a regular furrow along the outer surface, following it round until all the bark of the main roots and the surface wood are devoured, and the damaged root rots. The only previous record of *Leptops hopei* as a root pest in New South Wales was in the Mount Pleasant orchard at West Maitland many years ago. Mr. Scobie has recently informed me that they disappeared some years ago and are quite a thing of the past in that district.

This beetle, however, with several other weevils, has been found on various occasions doing a considerable amount of damage to the opening buds of vines and fruit trees. In this journal in 1898 the writer published an account of damage caused by the adult beetles in a vineyard near Glenfield, where thousands of them were hand picked and destroyed when feeding at night on the buds just as they were bursting on the vines. The roots of the apple tree examined by us (as can be seen in the illustration) were very badly damaged by the apple-root weevil larvæ, but the larvæ had left the roots and were resting in a cell in the hard clay several inches away from the root, and over 2 feet beneath the surface of the ground. Our first visit was made on 14th March last. Making further investigations Mr. Gallard says: "In digging for the fresh specimens I am sending, I completely undermined the tree, and found that all the roots deep down beneath it were completely denuded of their bark, and were dead up to within 9 inches of the surface. Above these the main roots from the trunk, and all the adjacent small roots, were perfectly sound and undamaged. The larvæ appear to be in various stages of development from a quite small state to one apparently full fed, but I did not find any showing signs of pupation."

### Life History of *Leptops hopei.*

The full-fed larva varies in colour from dull white to pale yellow, resting in its clay cell in the usual half-curled state so common in most weevil larvæ. The head is smooth and rounded, with the mouth parts reddish-yellow and the tips of the jaws black. The dorsal surface of the prothorax is smooth and pale yellow like the head, the rest of the thoracic and abdominal segments very soft and deeply wrinkled, and the terminal segment rounded and lobed. At this stage, when removed from its earthen cell, it is so soft and delicate to handle without damage that one wonders how it can work its way through the stiff clay in which it is resting. Its length is ¾ of an inch.




**Apple Roots destroyed by *Leptops hopei.***

Full-fed larvæ were kept under observation in damp earth for six weeks without undergoing any transformation, but all of them finally died without pupating. On 5th November, however, Inspector Gallard dug up a pupa under the roots of the apple tree, which enabled our artist to figure it. From the irregular development of the larvæ and pupæ it is probable that there is a second brood of beetles emerging toward the end of the summer as well as main broods in September and October.

French has described the peculiar habit of the beetle depositing her eggs upon an apple leaf and gumming the other side over it, and states that the young larvæ crawl down the trunk and make their way through the soil to the lower roots upon which they feed.

It was some time before we could verify these observations, though a close watch was kept upon the infested tree, where the beetles were found to be collecting together on the tips of its topmost branches and feeding on the foliage. On 3rd November, Mr. Gallard found several of the tree's

leaves folded over, and saw, on examination, that they were gummed on either half. On separating the two halves, he found a patch of eggs stuck to the surface with the secretion that held the leaf together.

A week later both the Inspector and I, having enclosed a number of the weevils in a mosquito-net bag sewn round apple tree branches in our respective gardens at Epping and Croydon, found, on examining the enclosed foliage, a number of folded leaves containing eggs. These eggs are semi-transparent, with a greenish patch at one end, elongate, cylindrical, with the extremities rounded and the sides slightly flattened through the pressure of the leaf. They measured 1½ mm. in length, and were placed side by side in rows. The numbers in each patch varied as follows :—97, 66, 62, 37, and 33. On 17th November we found the tiny beetle larvæ hatching out and crawling about over the leaves and the sides of the jar in which they were enclosed. They are curious dull white to semi-transparent maggot-like grubs, with small brown heads and well defined segments in the thorax and abdomen. Though legless, they were very active in drawing themselves along by the jaws, contraction of the segments, and a fleshy pad taking the place of pro-legs on the under-surface of the anal segment. Watching their movements under the lens, one could see that once they started it would not take them long to reach the base of the tree trunk, and to enter the soil to start their work upon the roots.

While digging in the soil under the infested apple tree on 21st August, Mr. Gallard obtained a perfect female beetle in an earthen cell about 18 inches beneath the surface of the ground. Several large larvæ were obtained at the same time about 6 inches deeper in the soil, but no pupæ have been found. Later on (4th September) he found three adult beetles (one male and two females) resting on the limbs near the top of the apple tree. The following list by Mr. Gallard of the perfect beetles collected from the apple trees in the infested orchard will give some idea of how the pest would have increased in this orchard if we had not been carefully looking over the trees at regular intervals and collecting all the adult beetles :—4th September, 3 perfect beetles; 12th September, 10; 15th September, 5; 26th September, 12; 26th September, 22 ; 5th October, 24; 6th October, 6. Total, 82.

The beetles vary much in size in the sexes, the female being nearly a third longer than the male and twice the bulk. In general form and structure they are alike, except that the abdomen of the female is much larger and her wing covers are rounded on the sides, convex on the dorsal surface, and turned down and pointed at the apex. The sculpture in the sexes is the same, the dorsal surface of the head between the eyes to the tip of the snout forming,

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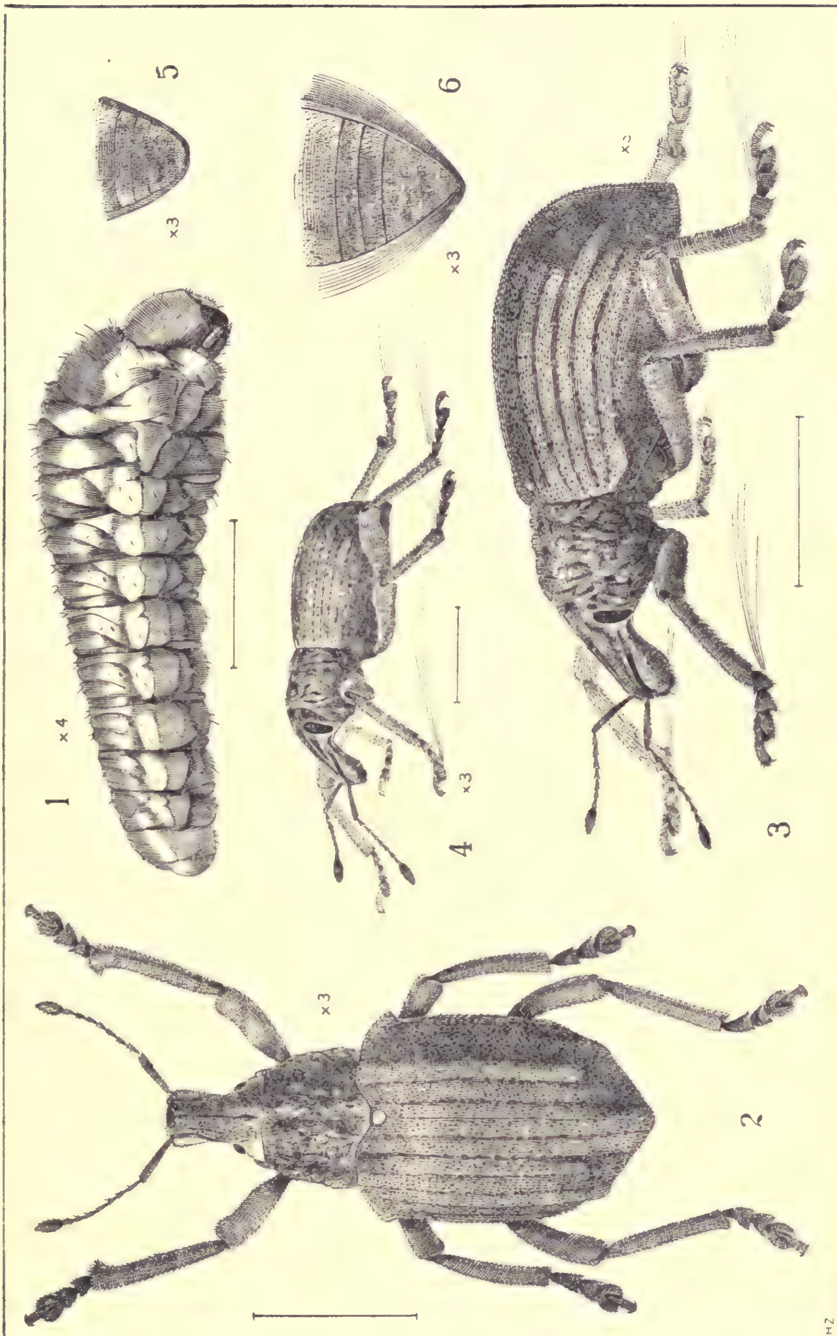
Description of Plate.

1. Larva of *Leptops hopei* (Apple Root Weevil).
2. Female beetle (dorsal view).
3. ,, ,, (side view).
4. Male beetle.
5. Tip of abdomen of male beetle.
6. Tip of abdomen of female beetle.




*Leptops hopei.*

with two deep parallel furrows, three well-defined black ridges. The thorax is very coarsely and irregularly corrugated, and the wing covers are barred with shallow parallel furrows, bearing rows of large punctures. The ground colour of the beetles is black, but the whole surface from the tip of the snout to the tips of the tarsi is so thickly covered with feather-like scales and the tarsi and antennæ with fine hairs that hardly any of the ground colour is visible. These scales are reddish buff, with scattered white ones interspersed or forming small patches among them. Some (particularly round the eyes) are iridescent and pale opaline pink. On the legs there are other scattered longer spiny-shaped scales.

### Protective Measures.

We have found that the beetles emerge from the soil from the early part of September until the end of November. If we can prevent them from gaining access to the foliage, and capture them when ascending the tree trunk, it will be possible to save the roots. A simple method would be to fix an inverted funnel or frill of tin or stiff oiled paper, over which the beetles could not crawl, round the trunk, about a foot from the ground, and to go round every week in the beetle season collecting and destroying those sheltering under the obstruction. They would be much more easily discovered there than under the foliage.

To capture the small larvæ crawling down the trunk, a band of paper smeared with sticky matter could be tied round it well up from the ground. Spraying the topmost foliage with arsenate of lead would kill the foliage-eating beetles if it was found that they had reached the leaves.

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## Treatment of Armillaria with Iron Sulphate.

A treatment which is claimed to have saved many apple trees from armillaria is practised by Messrs. Sim, of Capertee. The fungus, it may be remarked, will sometimes remain about the roots of a tree for a long time before it makes sufficient inroads to produce marked manifestations in the tree of its presence. The ingredient used in the protective treatment referred to is sulphate of iron, in the proportion of 1 lb. to 2 gallons of water. The orchardists above mentioned replied to an inquiry from the Department as to the application of the treatment as follows :—

The quantity applied to the trees depends upon the area affected. Our method is to bare the roots, scrape the affected parts, and pour on the solution from a watering can. In bad cases the soil in the vicinity of the parts attacked is saturated as a safeguard against reinfection. A gallon of the solution may be necessary in a severe case, and its use would be in no way harmful to the tree.

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"It is well to learn all we can to enable us to make the best use of our fruit," wrote a Henty correspondent in applying for a copy of "Fruit Preserving, &c." "Many thanks for the last fine budget of bulletins."

# Poultry Notes.

## JANUARY.

JAMES HADLINGTON, Poultry Expert.

DURING the year just closed poultry farmers, in common with all breeders of live stock, have found difficulty in procuring adequate supplies of food for their flocks, and the tendency of prices has been upward throughout the year. However, the poultry farmer has occupied a much better position in comparison with the breeders of large stock, because while the drought conditions that have prevailed have compelled the latter to hand-feed his stock, and in addition to lose large numbers of them, the poultry farmer has managed in nearly all cases to feed his birds; and the higher values received for his produce, particularly for eggs, has not only been a counter-balancing feature, but on a conservative estimate of production (say twelve dozen per hen) should have placed him in a better position than in previous years. In this respect the poultry farmer has, for once, been fortunate in the fact that the scarcity of eggs caused by high prices for food in other countries has induced an export trade which has assisted to keep up prices here. At the same time, it is questionable if the export trade has been solely responsible for the higher values. High food values are bound to be followed by higher prices for our products. I fear, however, that a combination of factors is responsible in a great measure for a lower standard of production on a great number of farms.

That there is something fundamentally wrong is patent to any observer, for while our laying competitions have shown that egg-production is more than being maintained, and that some of our best farms are also keeping well up to their best performances, the majority appear to be suffering from some malady that is sapping the vitality of the industry.

Observation leads me to conclude that that malady is stunted chickens, due principally to faulty methods of rearing.

Paradoxical as it may seem, the hatching of too many chickens is also in my opinion, an incubus that is assisting to strangle the prospects of an industry that otherwise would be a thriving one. The desire to possess too many chickens with inadequate provision for rearing them is the principal cause of the stunted growth complained of. Many farmers are increasing their incubator capacity who would do better if they increased their brooding equipment.

There is, perhaps, no better evidence of this fault than a market report that appeared in a Sydney paper early last month. It ran as follows :—

*Glut of Chicks.*—The market is overstocked with White Leghorn chicks of four to seven weeks, and they are selling (alive) at 9d. to 1s. 2d. per pair, with a few at 1s. 3d. to 1s. 4d. Dark table breeds of that age are 1s. to 1s. 6d. per pair, with a few at 1s. 7d. to 1s. 8d. Chickens of eight to twelve weeks have better sale, the White Leghorns at 1s. 3d. to 1s. 10d., and the heavy breeds at 1s. 9d. to 2s. 4d. per pair. Grillers of fair weight sell readily at 3s. 9d. to 4s. 6d. per pair.

At that very time cockerels from Hawkesbury Agricultural College and the soldiers' settlements, and also from many well-managed private farms, were making from 4s. 6d. to 5s. 6d. per pair for ten to twelve weeks old chickens, while four to five months old birds were making 6s. 6d. to 12s. 6d. per pair, and even White Leghorns were realising 8s. and over.

### The Outlook for 1920.

Many inquiries are being made relating to the prospects of the industry in 1920, some taking a pessimistic view because of the shadow of uncertainty that hangs over the question of food supplies between now and next harvest time.

One thing can be said—there is an ample supply of wheat in the Commonwealth, if not in this State. This assurance, together with the partial breaking of the drought (which will result in taking much of the larger stock off the consumption of mill offal and wheat, liberating it for the poultry farmers), should induce a more optimistic outlook. Then again, information received by the Department as to the prospects of next season for the export of eggs points to a period of fair prosperity, to say the least. In the meantime, the prospects are, unfortunately, for scarcity of foodstuffs and consequently for high prices—a condition of things that will weigh heavily upon the class of poultry farmer which of necessity must purchase in small lots and cannot afford to stock up.

### A Reminder about Chicken-pox (Warts).

It should be understood that chicken-pox is a definite blood disease, and that once contracted it will run its course in like manner to a fever. There is no cure, and the only amelioration of the disease that is possible once it attacks a bird, is to dry up the scabs, for which there is nothing better than tincture of iodine.

The severity of the disease can be controlled, however. In fact, a faithful administration of flowers of sulphur in the morning mash at the rate of 1 oz. to fifty full-grown birds two or three times per week for short periods of two or three weeks consecutively, substituting Epsom salts in the drinking water for two or three weeks and then returning to the sulphur, will make the birds practically immune. This treatment should begin this month.

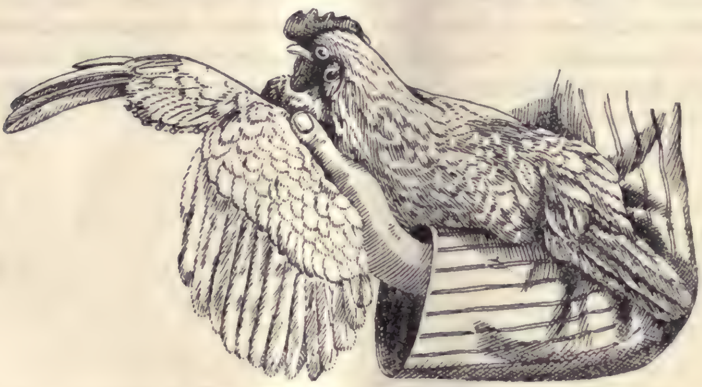
### How to Cut a Bird's Wing.

The flying propensities of such breeds as the White Leghorn makes the cutting of wings almost imperative, particularly when the wire-netting

enclosures are not good. The common practice of cutting the wing of a pullet right across the primary, secondary, and wing coverets gives an unsightly appearance to the birds. One often sees an otherwise fine-looking lot of White Leghorn pullets spoiled in appearance by the fact that the wings have been cut in a manner suggesting that the sides of the birds had been driven in, or that they are flat-sided. This is not only unsightly, but it detracts from the value of birds if they are being sold for stud purposes.

### Wing-cutting for Competitions.

The regulations governing the Hawkesbury Agricultural College Egg-laying Competition call for the cutting of one wing before the birds are sent to the College. The manner in which most of the wings are cut shows want of knowledge or carelessness on the part of many competitors, and the birds



**Correct Method of Cutting a Bird's Wing.**

It will be seen that, with the exception of the three first feathers, the whole of the flight feathers have been cut out, leaving their coverets untouched, while the secondaries and their coverets are left intact.

are not shown to best advantage in the pens. But worse still, if these particular birds happen to attain a position in the competition which warrants photographs being taken, they are illustrated at a disadvantage.

For the purpose of inducing an improvement in this regard, and for the information of readers of these notes generally, an illustration is given showing the correct method of cutting the wing of a bird so that it will not offend the æsthetic, nor depreciate the value of the bird. No more labour is involved in cutting a wing in the manner shown than would be involved in cutting it the wrong way.

As will be seen in the illustration, only the primary wing feathers are cut and not all of these, two or three feathers being left to form the bow at the front; when the wing is closed it appears to be a full wing, while when extended there is the gap shown. This gap is quite effective in preventing the bird from flying.

On the general question of prevention of flying, one is often met with the assertion that no wing-cutting will prevent some Leghorns from flying over fences; but it will generally be found that low or dilapidated fencing with shrubs, trees and other objects near the wire-netting, together with a want of method on the part of the attendant, is responsible for much of this trouble. What is meant by lack of method is this. Starting at this time of the year in particular, pullets coming on to lay will commence to fly about; the attendant at once becomes annoyed, catches the offending bird, cuts or pulls out flight, secondaries, and often the coverets of one or both wings, thinking to make sure that she, at least, will not fly again; more are caught in the act, and are put through the same process, which becomes interminable. The right thing to do is to shut all the pullets up in their house at night and next day go through the lot and cut the wing in the way described above.

In regard to pulling the wings, that practice is almost useless because only six weeks is required to grow a new wing, whereas the cutting lasts until the bird has moulted. One wing cut is more effective than two, because the bird then loses her balance.

## Malnutrition in the Hive.

"I have been trying to find out the cause of brood dying here and there in the cells," wrote a West Tamworth correspondent recently. "The brood dies in various stages up to the time the grub is fully developed but without wings—perfectly sealed up, but with no odour or dead matter. The trouble is not for the want of pollen or honey."

"It is an unusual occurrence for larvæ to be found dead in the cells as stated," replied the Senior Apiary Inspector. "Similar cases, after a severe abnormal condition, such as drought, have been noticed previously, and microscopical examination has failed to reveal the presence of any organism. It is considered that during such abnormal conditions some of the food gathered by the bees was chemically incomplete, and therefore not sufficient to bring the larvæ to maturity. If the case under notice is similar, the colonies will not be affected for any length of time."

## Destroying Starlings with Poisoned Grain.

The destruction of starlings is a difficult task, and their extermination by means of poisoned fruit—because of the possibility of this being afterwards consumed by human beings—is attended by some danger. If poisoning is preferred to shooting, an effective method (in fields or the vicinity of stacks) is to attract the birds to a regular place by feeding them for some days with good grain and then setting out poisoned grain. A preparation that has been used with success in South Australia is made by adding a teaspoonful of strychnine and a teaspoonful of washing soda to 3 pints of water, in which a little sugar has been dissolved. The mixture should be boiled until all the ingredients are melted and then mixed with 12 lb. of wheat.—W. W. Froggatt, Government Entomologist.

# Orchard Notes.

## JANUARY.

W. J. ALLEN and W. LE G. BRERETON.

MOST of the fruit areas had more or less beneficial rains during December, and it is to be hoped that care has been taken to see that as little as possible of this has been lost to the trees either by evaporation or through the growth of weeds. This will have involved the use of cultivators and hoes. Such weeds as summer grass grow very quickly at this season, and where it has happened that repeated showers have prevented the use of the cultivating implements, allowing these weeds to grow beyond the control of the cultivator, the plough will have to be brought into use. It is in such cases that light multiple ploughs are very useful, as it is obvious that this work must be pushed through quickly, or much loss of moisture will occur before it is completed.

Any of the land near the trees, both young and old, that cannot be reached by the cultivator or plough should be worked and kept clear of weeds with either the pronged or flat hoe. The conservation of moisture in the soil for the trees at this season is important, not only in order to mature the hanging fruit, but also for the formation of well-nourished fruit buds for next season. Consequently it is bad policy to neglect the early varieties from which the fruit has been gathered.

### Seed for Cover Crops.

In the districts where the rainfall is generally sufficient, or where irrigation is practised, it would be wise to order the necessary seed now. On the coast the Grey field pea is giving satisfaction for this purpose; but for inland parts the trouble is to get a crop which will give sufficient growth before it is time to plough it under in July, and so far rye has not been surpassed in this respect.

### Budding.

Provided the sap is running freely, budding of either nursery stock or old trees can be carried out this month. Where old trees to be worked were cut back at the end of the winter, they should by this time have made plenty of young shoots mature enough to bud into.

The bark of these shoots is not thick, and should offer no difficulty, even to the novice, but it is wise to work more shoots than will ultimately be required for the formation of the new tree, as there is likely to be some loss from heavy winds and other causes. Moreover, with thick limbs, if at least two shoots are left, one on the top and one on the bottom side, the sap is kept moving on both sides, and there is no chance of the bark dying away on one side. If both are budded, both resultant shoots should be trained in the

one direction, so that if one is lost the other will take its place. After the callus has crept well over the edges of the top wound where the original thick limb was cut back, one of the budded shoots can be dispensed with; although this leaves a wound it is one that will heal over very much more readily than the top wound referred to above.

Where it is desired, old trees that have not been cut back, and have no young shoots low down, can be budded direct into the old bark. Owing to the thickness of the bark and the pressure it exerts, it is more difficult to slip in the buds, and the work is slower. As a rule, the bark on the lower side of limbs, owing to its more shaded position, will lift more easily than that on the upper side. In the following spring, when the limbs are cut back to start the buds, in the event of a shoot starting on the upper side, it should be checked to prevent it from sapping the shoot from the inserted bud, but it should not be rubbed right off, as it will serve to keep the sap moving on the upper side and prevent any of the bark dying, as just described. Later it also could be budded and held as a safeguard in case the shoot from the bud inserted in the old bark be blown out or meet with other accident—as in the former case the secondary bud could be cut away after the callus has crept well over the edges of the wound where the old thick main limb was cut back.

A bulletin entitled "Budding and Grafting" may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney.

### Summer Thinning and Pruning.

Young trees that are being transformed by previous re-working will still require to be inspected periodically, and superfluous growth cut away, or topped, as has been described in previous months. Older trees, too, that are still making vigorous growth, especially those which have been topped during previous winter pruning, can advantageously have any leaders removed that are not required for budding the future framework of the tree. This reduction of strong leader growths allows more light through the tree, and the result is the better development of fruit buds and spurs in the body of the tree.

This is also a good time to shorten back the laterals of pears, apples, or plums that otherwise do not spur readily.

### Marketing Problems.

Picking and marketing of summer fruits will be mostly completed in the coastal districts this month, but in the inland districts where the later varieties of stone fruits are grown harvesting will be at its height, and, in the tableland apple and pear districts, only about commencing. Since Victoria and Tasmania have organised standard grades, the growers of this State, as a whole, have become more interested in the matter, which is now under consideration by the Fruitgrowers' Association. It requires no great imagination to see the advantages of fixed standards universally adopted by the growers of the State, but until such materialise it is well to consider how individual grading may be improved.

One of the stumbling blocks is the failure to fix standards. A grower marks the best fruit in a consignment "first grade," and, notwithstanding that the best fruit in later consignments is not of equal quality, he still marks it "first." If, however, certain standards were fixed for the various grades and rigidly adhered to, the "first," "second," or "third" grade of one consignment would be the same as that of any other consignment.

Again, the size of fruit alone is generally allowed to be too much the controlling factor in determining the grades, but it is well known that often medium-sized fruit will sell as well as big fruit of the same quality. Hence, the quality determined according to colour and general attractiveness and freedom from blemishes should be the chief factor controlling the grades, although, as very small fruit is generally hard to sell, a limit to the small size should be fixed for the various classes of fruit that would be allowed in first and second grade, and all sizes above that should be classed as first or second according to its quality.

Apricot drying will have been completed early in the month, and peaches fit for drying will be commencing to ripen towards the end of the month. All fruit for drying should be thoroughly ripe. A bulletin giving detailed instructions for this work may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney.

### Pests.

In districts where codlin moth is troublesome, an extra application of lead arsenate would be advantageous, except on apples and pears that are almost ready for picking. All infested fruit should be regularly collected and destroyed by boiling. It then can be fed to fowls or pigs.

If red, brown, or wax scale or white louse are bad on citrus trees it may be necessary to treat them this month by either spraying or fumigation. If possible, however, it is preferable to wait till later in the season, when the greater part of the eggs have hatched out. If any deciduous trees are found affected with San José scale, spraying with resin wash as soon as the fruit is picked is recommended, but this treatment should be followed by a thorough application of lime-sulphur (winter strength) or miscible oil when the trees are dormant in the winter.

## Bokhara Clover on the Southern Tablelands.

The success of sweet clover or Bokhara clover (*Melilotus alba*) for grazing purposes in the New England district was the subject of an article in last issue of this *Gazette*. Equally encouraging results have been obtained by Mr. J. Chisholm, M unt Darragh, *via* Cathcart, from a sample packet of seed forwarded to him by the Department. Mr. Chisholm writes that the seed was sown on 13th September, 1918. It was cut for cow feed on 1st October of the present year, being then a foot high. On 19th November, its height was 2 feet (growth for seven weeks), and it was being cut for hay. It had a very scented smell when dry, and cattle ate it readily, although there was plenty of grass outside. Chilian clover did well, but did not produce the amount of fodder that Bokhara did.—E. Breakwell.

# Agricultural Bureau of New South Wales.

### Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion:—

*Have you ever tried growing vegetables for sale in your neighbouring town? Some farmers have found it a very profitable side line. What conditions would you regard as necessary in your district for such a development, and what class of crop would you favour?*

*What are the chief attractions to you of rural life? Do you consider the environments of the farm and bush a sufficient set-off to the attractions of the city, even if less exciting in their appeal, and in what order do you place them in your preference?*

*Do you find the topping of maize (i.e., cutting the stalk above the cob) to be worth the trouble and expense? Have you observed it to affect the yield, or any other factor of importance in growth? If you remove the top, at which stage do you do so?*

*What class of crop do you prefer for green manuring? Have you had any experience with legumes, and, if so, how do they compare with rye or rape in their effect upon the yield of fruits in the following year? Some farmers say that under dry conditions, legumes do not make sufficient growth, and others that they compete too severely with the trees for soil moisture when the rainfall is low. Has your experience confirmed or refuted such statements?*

*Have you been successful in the control of peach tip moth, and what has been your method? Have you tried bandaging to trap the grubs, and, if so, how often do you examine the bandages, and with what results?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.*

### Bimbaya.

A meeting of the above branch was held on 8th November, when an article on mixed farming was read from the *Agricultural Gazette*, and provoked a useful discussion. Members considered that coastal farmers should run a few sheep on their farms in addition to the stock usually carried.

### Coraki.

Since the opening of the new year the operations of this branch have been very satisfactory, new members being enrolled at nearly every meeting.

A meeting was held on 18th November, when the principal matter under discussion was silos and silage, the conditions prevailing on the coast at

the present time having brought the question of conservation of fodders forcibly before the farmers.

The article in the November issue of the *Gazette* by Mr. G. C. Sparks on stack silage was appreciated by members and freely discussed.

The secretary of the branch thinks it safe to say that in the near future fodder conserved by this method will be extensively in evidence.

### Cardiff.

On 30th October Mr. W. W. Froggatt, Government Entomologist, delivered a lecture on insect pests in the orchard.

The lecturer showed by lantern slides the various orchard pests, explaining their habits and the best mode of destroying them. Mr. Froggatt fully explained the ways and means of combating the peach tip moth. Several growers had questions to ask, mostly referring to the flying fox and its destruction. Some suggestions as to the destruction of the flying fox were made by members, and were mostly regarded by Mr. Froggatt as worth trial.

At the annual meeting of this branch, the following office-bearers were elected for the ensuing year :—Chairman, Mr. E. Rowe; Vice-chairman, Mr. H. Walker; Treasurer, Mr. J. Cockburn; Hon. Secretary, Mr. A. Barratt.

The balance-sheet showed a credit of £14. Ten new members were enrolled.

### Cotta Walla.

A lecture on maize growing was delivered by Mr. H. Wenholz, Inspector of Agriculture, to the members of this branch on 28th October.

The value of maize as a fodder crop and for silage purposes under the local conditions was pointed out. It was desirable that a short-seasoned variety should be selected, and Hickory King and Leaming were mentioned as the best varieties for the purpose. The advantages of the stack method of making silage (as recently described in the *A ricultural Gazette*) were referred to and preferred for the district as against pit silage, the heavy rains usual in the district being liable to get into the pit and damage the fodder. No doubt it was considered that the district was somewhat high for growing maize for grain, but there were varieties that could be used for the purpose. In cold districts it could be used for horse feed, being most valuable for hard work in cold weather; indeed, it was the best grain known for conserving body heat and energy.

Early preparation of the soil would give the best results with maize in this district; the land should be ploughed before winter, cultivated in the early spring to give a good seed-bed, and the seed sown in October or November. Feeding down maize with sheep before harvest was a common practice in maize-growing districts, and on the coast pigs were sometimes allowed to harvest the crop. Rotation was important as a means of maintaining soil fertility and leguminous fodder crops were particularly valuable.

### Cunningham.

A meeting of the above branch was held on 7th November, when a lecture was delivered by Mr. H. E. Laffer, Viticultural Expert. The lecturer was closely followed in every detail, and all present highly appreciated the advice given and the very clear manner in which the subject was handled.

### Dural.

At the last meeting of the above branch, the questions which appeared in the November issue of the *Agricultural Gazette* were discussed.

It was agreed that the rule in the district was to mulch young trees with stable manure and this medium was considered much superior to anything else, though bush leaves were also considered good. Members had had no experience of one-way disc cultivators, the spring-tooth cultivator being almost generally used, and being considered by many prominent growers as the best orchard implement in existence. The disc cultivator was used at Dural for young summer grass about December.

### Garra-Pinecliffe.

The annual meeting of this branch was held on 6th November, when the secretary's report showed a satisfactory state of affairs, and the balance-sheet a useful credit balance.

The election of officers resulted as follows :—Chairman, Mr. W. Forester; Vice-chairman, Mr. H. Robards; Treasurer, Mr. S. Robards; Hon. Secretary, Mr. S. W. Packham.

### Jilliby-Dooralong.

A meeting of this branch was held on 5th November, there being an attendance of seven members. The business was of a general character. A discussion took place on the marketing of pigs, and it was generally held that disappointing prices were received, due largely to pigs that were not really in the best condition for market being sent to the sales.

### Lidcombe.

At a meeting of the above branch held on 20th October, at which thirty-five members were present, a lecture was given by Mr. A. A. Ramsay, Principal Assistant Chemist, on the use of lime in the garden.

Mr. Ramsay said it was not known when the use of lime was first discovered as a manure for the garden, but mention was made of it in Pliny's writings of 50 A.D. During the sixteenth and seventeenth centuries lime and dung were the only two manures in use for the enrichment of the soil.

Quicklime was chiefly used for altering the physical condition of the soil. This action was accompanied by destruction of a certain amount of organic matter, which must be replaced. Nitrogenous manures such as blood, bone and blood, or ammonium sulphate should not be used immediately after the application of lime, as a loss of nitrogen would result. An interval of two or three weeks should be allowed.

Limestone or calcium carbonate had not been so extensively used owing to its not being procurable in a finely ground state. Recently, however, this product had been put on the market in a suitable condition and its use was increasing. This calcium carbonate sweetened the ground without destroying the organic matter present. The use of both forms of lime would liberate potash from any potash silicates present.

Dealing with quantities to be applied, the lecturer stated that it was preferable to apply the lime in smaller quantities at more frequent intervals, rather than very large quantities at longer intervals. Upon average ground 10 cwt. per acre would be sufficient, but where the soil was exceptionally heavy or poor, larger dressings might be applied.

At a meeting on 3rd November, at which there was an attendance of thirty-one members, a lecture was given by Dr. Darnell-Smith, Biologist, on plant diseases. Following is a condensed report :—

The lecturer pointed out that plant diseases might be divided into two classes—(1) physiological diseases brought about by some adverse conditions of soil or climate; and (2) fungus diseases caused through the attack of certain parasitic fungi.

Plants obtained their food from the air, water and soil. Those chemical elements which the plant required for its nutrition and which must therefore be regarded as part of its food were carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus and perhaps chlorine, and the metallic elements potassium, calcium, magnesium and iron were also necessary. The lack of any one of these or its presentation in unsuitable form might cause a physiological disease, and it was the work of the horticulturist to remedy defects in soil by the judicious application of artificial manures. In general the elements most likely to be lacking were nitrogen, phosphorus, potassium and calcium, of which a deficient supply was supplemented by the use of such artificial fertilisers as ammonium sulphate to supply nitrogen, superphosphate to supply phosphorus, potassium sulphate to supply potassium, and lime to supply calcium. When buying superphosphate or potash the labels on the fertiliser bags were sometimes confusing. The higher percentages in the guarantee meant nothing; a guarantee of 4 to 5 per cent. of potash was a guarantee of 4 per cent., and it would be the same if it said 4 to 50 per cent.

Lime was obtainable in two forms—quicklime and carbonate of lime. The effects of quicklime in breaking up clay and of carbonate of lime in neutralising soil acidity were pointed out and the influence of the presence of lime on the health of plants indicated. In applying fertilisers easily soluble in water the danger of producing too dense a medium around the delicate root hairs was dwelt upon. Fungi might be divided into five main classes, and in each class there were members which were dangerous plant parasites. A member of each class and its method of attack was described and remedies suggested. Reference was made to the finger-and-toe disease of cabbage, diseases due to bacteria, Irish blight of potatoes, downy mildew of grape vines, and ripe rot of oranges, passion fruit and apples.

Another meeting was held on 17th November, when a lecture by Mr. H. J. Rumsey, on the subject of seasonal vegetables, was well attended.

### Lower Portland.

A meeting of the above branch was held on 5th November, when there was an attendance of eleven members.

A paper was read by Mr. Christie on the subject of lime. He had used it, he said, in almost every form with beneficial results, and had found that limed land held the moisture better than unlimed land. Lime had the power of liberating potash and phosphoric acid which were present in the soil, and making them available for plant food. For light soils which were sour or deficient in lime, he preferred carbonate of lime or agricultural lime, which was not so caustic in its action as stone lime, though the latter was better for breaking up heavy clay soils. He had used gypsum for grape vines beneficially.

Departmental Note.—The Chief Inspector states that lime causes unavailable potash to become available for plant use by chemical action; it does not directly affect phosphoric acid in the same way, but the improvement which it makes in the condition of the soil causes chemical nitrifying agencies to become more active and consequently the fertility of the soil is improved.

At one time it was the custom to apply heavy dressings of lime, but it is now considered that better results are obtained by small applications at more frequent intervals. The Department generally recommends a dressing of about 1 ton per acre, and this is repeated yearly if the condition of the soil renders it necessary.

Under special conditions (such as in cases where the soil is of a heavy nature and it is required to fit it for special crops) heavier dressings are recommended. The price of lime, however, makes heavy applications for ordinary purposes too costly.

### March.

A meeting of the above branch was held on 17th September, when a paper on orchard pests and methods of destroying them was read by Mr. G. Mitchell.

Mr. Mitchell said the worst and most common orchard pests might be divided into two classes, fungi and insects. Black spot, shot hole and powdery mildew were the worst of the first class; while the second class had to be divided into two types, one of which (like aphis, San José scale, red spider and others) sucked their nourishment from the leaves and fruit, while the other (like codlin moth, pear slug, vine moth and some large beetles) devoured the leaves and fruit by biting.

He advocated preventive measures in connection with fungus diseases, mentioning particularly (*a*) the planting only of varieties immune from the pests; (*b*) proper methods of drainage; (*c*) pruning to admit sun to the ce tre of the tree; and (*d*) spraying with suitable fungicides, of which he preferred Bordeaux mixture.

For the insects he advocated the sprays recommended by the Department.

### Matcham.

The annual meeting was held on 8th November, the following officers being elected :—Chairman, Mr. C. Cox; Vice-chairmen, Messrs. W. Pritchard and H. Dubois; Treasurer, Mr. A. Macinante; Librarian, Mr. W. R. Crossland; Hon. Secretary, Mr. J. Dodd.

### Middle Dural.

A meeting of the above branch was held on 10th October, when Mr. Cranston occupied the chair.

Mr. J. T. Eagle reported the books audited and found correct. Mr. Cranston gave a detailed report of the annual conference held at Orange.

### Milbrulong.

The monthly meeting of the above branch was held on 4th November. Following usual business, which included a motion that arrangements be made to have grass plots in the district, an interesting address was given by Mr. L. S. Harrison, Assistant Inspector of Agriculture, on the Agricultural Bureau and its benefits to farmers.

### Mittagong.

Mr. J. Hadlington, Poultry Expert, delivered an address at this branch on 11th September. Mr. Hadlington screened a number of slides illustrating the progress that is being made on the group settlements of returned soldiers in which poultry farming is the principal activity. Discussing the industry itself, Mr. Hadlington gave valuable advice on the housing and feeding of fowls and treatment of various troubles. He strongly condemned in the last connection the feeding of charcoal to chickens.

In proposing a vote of thanks, Captain Fairley remarked on the necessity for better conditions for marketing eggs ; co-operation and cold storage facilities, he said, would greatly increase farmers' returns.

### Moss Vale.

The annual meeting of this branch took place on 7th November. Mr. H. Monk was elected chairman, and the remaining officers re-elected. A pleasant social evening followed the completion of business.

### Penrose-Kareela.

The annual meeting of this branch was held on 15th November, but owing to the weather the attendance was not good. It was therefore decided to hold over the election of officers-bearers until the next meeting.

The balance-sheet to 15th November showed a credit balance of £3 5s. 7d.

### Springside.

A well-attended meeting of this branch was held on 4th November, when a lecture was given by Mr. John Swan on orchard pests and their remedies.

Mr. Swan dealt with the history and habits of the more widely known pests and methods of dealing with them, and replied to numerous questions.

### Stratford.

The monthly meeting of this branch was held on 8th November, when twenty members attended, and two additional ones were enrolled.

Following general business, Mr. T. Ninnes, of Craven, gave a very instructive lecture on first aid. The discussion lasted a couple of hours, during which time Mr. Ninnes answered a number of questions asked by members.

### Tallawang.

At a meeting held on 14th October, a lecture was delivered by Rev. G. Nelson Bensley on co-operation and co-partnership. A summary of the paper follows.

#### Co-operation and Co-partnership.

At the end of this great war they must adopt a policy of reconstruction, said the speaker. Individual effort of every character must have an effect on the community, and each action of the community must leave its mark on the nation, and so each part contribute to the advancement or retrogression of its whole. If Australia was to take her proper place as the world advanced, they, as individuals, must not shirk their duties towards her progress. Through co-operation they could make their best individual efforts one great combined effort.

The Agricultural Bureau undoubtedly made for individual and communal benefit, and other such farmers' unions and associations as were in existence—provided they carried the principles of co-operation right through and were not swayed by political considerations—could go far to raise the status of the primary producer to its proper plane. Decline of rural population, caused by the lure of the city with its apparent social advantages, could be more effectively remedied by social co-operation and the improving of rural social life, than by inducing the city clerk to become a farmer.

The banding together of farmers and graziers for the purpose of owning their own plants, for treating and marketing their products, and even for the manufacturing of implements for their production, was not only within the realms of possibility, but in some countries was an accomplished fact. The advantages of such a system were obvious. By selling and marketing in bulk quantities, the co-operative society could get better prices, and by the elimination of the middle man, return a direct profit to the farmer. The supply of implements to its members on the easiest of terms, and the purchase of "co-operative" implements to be used and passed on were other useful spheres of activity. The same principle could also be applied to live stock.

Conservation of fodder on a co-operative system, the speaker pointed out, enabled the farmer to have a supply of feed in bad years, according to the amount he had supplied in good years, and if his requirements were in excess of his contribution, he could purchase from his own society at the price ruling in good years.

Co-operative ownership of water conservation and irrigation schemes would enable the farmer to have a plentiful supply of water at cheap rates; under present conditions the 26-inch rainfall of the district was practically allowed to go to waste.

References to the success with which insurance of stock, crops and property, on co-operative principles, had been carried out, and the advantages to be gained by having a co-operative agricultural credit bank behind the farmers of the district, concluded an interesting lecture.

The principal feature of the meeting held on 5th November was a lecture by Mr. F. Whitehouse, of the Stock Branch, on the farm horse.

Mr. Whitehouse dealt in detail with the various types of farm horse, describing their conformation; and by means of blackboard sketches he illustrated what unsoundnesses were, and how they could be immediately detected. He also explained the symptoms

of the more common complaints of the digestive tract, giving the treatment in each case; and spoke at some length with regard to the care of mares in pregnancy, incidentally referring to some cases of difficult parturition. By means of sketches he showed the various forms of presentation of the fœtus and indicated what could or could not be done in assisting the mare in delivery.

The lecture was extremely interesting and helpful, and was received with great appreciation by members of the branch.

At the meeting of this branch on 12th November a lantern lecture on Burrinjuck dam and the irrigation settlements at Yanco and Mirrool was given by Messrs. H. Rivel and J. Moon. The lecturers exhibited about eighty very fine slides, and covered the whole history of the scheme from its inception to the present day.

### Thyra-Bunaloo.

A meeting was held on 4th October, and was followed on 8th November by the annual meeting, at which eleven members were present. Two new office-bearers were elected, Mr. P. W. Sinclair, Treasurer; and Mr. E. J. Berryman, Vice-chairman.

It was decided that on account of harvesting operations, no meetings should be held until about February, 1920.

### Toronto.

The monthly meeting was held on 4th November. During the evening several motions were adopted, including one deciding that new members be admitted by open vote. Nine new members were also enrolled.

### Wellington.

The monthly meeting was held on 28th October, when a paper on tomato-growing was read by Mr. H. A. Flanagan.

#### Points in Tomato Growing.

Mr. Flanagan advocated sowing the seed about the middle of July in seed boxes covered with hessian, and placed in a hot bed to force the young plants forward. When about 2 or 3 inches high they should be transplanted into small pots and the pots sunk in the hot bed, still being protected from frost. About the second week in September they could be planted out, and in this connection he advocated trellising. The trellises should be 4 feet to 4 ft. 6 in. apart, and the plants 15 to 18 inches apart in the rows, with palings or sticks 5 feet high up which the plants could climb. The plants should be pruned to one stem. As to varieties, he preferred Chalk's Early Jewel (a very early sort and a splendid keeper), Burwood Prize as a second early variety (though not adapted for trellising) and Dwarf Champion (which did not require staking).

By careful pruning, tomatoes could be made to ripen three or four weeks earlier than they otherwise would. This pruning consisted of pinching off all the lateral growth of shoots, leaving only the main stem, which was trained up the trellis or stake. A lateral shoot started from just above the leaf on the main stem. The leaf should not be touched, but the shoot should be pinched off as close to the stem as possible, without damaging the leaf. The flowers were thrown out along the inner stem, and care should be taken that they were not damaged. The ground should be kept in a moist condition, though not too much water should be given.

#### Culture of Roses.

At the same meeting Mr. C. Kimbell read a paper on rose growing, in which he said the best soil medium for growing roses was a strong loam with good red or yellow clay for the subsoil. The drainage should be good, for no surplus water should remain in the ground. The soil should be well and deeply worked, and if the roses were on their own roots they should be planted about 6 inches deep. The best months during which to plant were April, May, and June, but it was wise not to plant immediately after rain if the ground was sticky. Of manures he had found cow dung to be the best.

At a meeting on 11th November, Mr. E. Broome read a paper on farm economy. He urged that farmers should adopt progressive methods—not only as to the cultivation of their land but also in the general management of the farm property.

Some effort should be made to avoid the waste of fodder which took place in seasons of abundant growth, said the speaker; mixed farming should be adopted and fodder crops grown to increase the stock-carrying capacity of the farms. Co-operation in the purchase of machinery, marketing of products, and elimination of the middle man was also warmly advocated.

During the discussion that followed, Mr. Broome remarked that in a good season some farmers would not miss a sum like £100 spent in putting good dams on their properties, but in a bad season they would be most valuable.

DEPARTMENTAL NOTE.—Mr. A. H. E. McDonald, Chief Inspector of Agriculture, remarks that the Agricultural Bureau can do work of great value in initiating discussions on farm economy and co-operation. Future success depends more upon these two factors than upon anything else. It must be admitted that at present most of the losses of farmers are due to uneconomical working and lack of co-operation. By meeting, farmers are able to discuss agricultural matters, and these discussions have been proved to lead to improvements being made by the individual farmer. Such meetings also pave the way to co-operation. In the past farmers have suffered great losses because they were disunited, and consequently have been unable to utilise their opportunities. The individual farmer is often unable to command much capital; but by combination farmers have great resources and these can be utilised for the benefit of all. By means of this capital they are able to market their products to greater advantage; and it could also be made the means of very largely preventing the disastrous losses caused by recurring droughts, by being used to finance great reserves of fodder.

### Windsor.

At the meeting of this branch on 23rd October, Mr. C. W. Farlow in the chair, Mr. W. W. Froggatt delivered a lecture on farm and orchard pests. He described the insects that most commonly attacked farm and orchard crops, and indicated the methods by which they could be kept in check. The moths, fruit flies, aphis, beetles, and scales, as well as other kinds of pests, were referred to, and the vote of thanks accorded Mr. Froggatt at the close was a hearty one.

### Woonona.

A meeting was held on 11th November, when there was a fair attendance of members. Fourteen new members were enrolled.

The business of the evening was a paper by Mr. Eastman, on the spraying of fruit trees. Mr. Eastman dealt very exhaustively with the subject and with the various diseases common to the district. At the conclusion, a general discussion took place, and Mr. Eastman answered several questions.

### Yarramalong.

At a meeting of this branch on 26th November Mr. E. J. Shelton delivered a lecture on pig-raising, a report of which will appear next month.

### Yarrunga-Avoca.

The annual meeting was held on 8th November, when there was a good attendance of old members and a few new ones.

The election of officers for the ensuing year resulted as follows :—Chairman, Mr. C. Wright; Vice-chairman, Mr. W. S. Smith; Treasurer, Mr. J. N. Starkey; Hon. Secretary, Mr. M. Spain. A committee was appointed to prepare a programme for the coming year.

# AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Kiama A. Society ... ... ... ... ... | G. A. Somerville | Jan. 24, 26 |
| Nimbin A. and I. Society ... ... ... ... | R. R. Southwell... | ,, 27, 28 |
| Gosford and Brisbane Water A. and H. Association (Gosford). | H. G. Parry ... | ,, 30, 31 |
| Berry A. Association ... ... ... ... ... | W. Pryor ... | Feb. 4, 5 |
| Tweed River A. Society ... ... ... ... ... | T. M. Kennedy ... | ,, 4, 5 |
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| Ulladulla A. and H. Association (Milton) ... ... | R. F. Cork ... | ,, 18, 19 |
| Dapto A. and H. Society ... ... ... | F. James ... ... | ,, 20, 21 |
| Wyong District A. Association .. ... ... .. | C. N. Walters ... | ,, 21, 22 |
| Alstonville A. Society ... ... ... ... ... | C. D. McIntyre ... | ,, 24, 25 |
| Inverell P. and A. Association ... ... | J. T. Dale ... | ,, 24, 25, 26 |
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| Dorrigo and Guy Fawkes A. Association ... ... | R. R. Blair ... | ,, 25, 26 |
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| Newcastle A., H., and I. Association ... ... ... | E. J. Dann ... | ,, 25, 26, 27, and 28. |
| Yanco Irrigation Area A. Society ... ... ... | R. Tribe ... ... | Mar. 2, 3 |
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| Tumut A. Association ... ... ... ... ... | T. E. Wilkinson... | ,, 3, 4 |
| Manning River A. and H. Association (Taree) ... | L. Plumer ... | ,, 4, 5 |
| Berrima District A., H., and I. Society ... ... | C. E. Wynne ... | , 4, 5, 6 |
| Wollongong A., H., and I. Association ... ... | W. J. Cochrane ... | ,, 4, 5, 6 |
| Nepean District A., H., and I. Society ... ... | C. J. Welch ... | ,, 5, 6 |
| Bangalow A. and I. Society ... ... ... ... | W. H. Reading ... | ,, 9, 10 |
| Glen Innes and New England P. & A. Association ... | G. A. Priest ... | ,, 9, 10, 11 |
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| Tumbarumba A. Association ... ... ... ... | W. R. Figures ... | ,, 10, 11 |
| Hunter River A. and H. Association (West Maitland) | E. H. Fountain ... | ,, 10, 11, 12, and 13. |
| Armidale and N.E. P., A., and H. Association ... | A. McArthur ... | ,, 16, 17, 18, and 19. |
| Cobargo A., P., and H. Society ... ... ... | T. Kennelly ... | ,, 17, 18 |
| Macleay A., H., and I. Association .. ... ... | E. Weeks... ... | ,, 17, 18, 19 |
| Camden A., H., and I. Society ... ... .. ... | A. E. Baldock ... | ,, 18, 19, 20 |
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| Upper Hunter P. and A. Association (Muswellbrook) | R. C. Sawkins .. | ,, 24, 25 |
| Walcha P. and A. Association ... ... ... ... | S. Hargrave ... | ,, 24, 25 |
| Royal Agricultural Society of N.S.W. ... ... | H. M. Somer ... | March 29 to April 7. |
| Batlow A. Society ... ... ... ... ... ... | C. S. Gregory ... | April 13, 14 |
| Bathurst A., H., and P. Society ... ... ... | S. V. Turrell ... | ,, 14, 15 |
| Upper Manning A. and H. Association (Wingham)... | D. Stewart ... | ,, 21, 22 |
| Dungog A. and H. Association ... .. .. ... | W. H. Green ... | ,, 28, 29, 30 |
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| Murrumbidgee P. and A. Association (Wagga) ... | A. F. D. White ... | ,, 24, 25, 26 |
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| Ganmain A. and P. Association ... ... ... | T. S. Henderson... | ,, 14, 15 |
| Northern A. Society (Singleton) ... ... ... | J. T. McMahon ... | Sept. 15, 16, and 17. |
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| Junee P., A., and I. Association ... ... ... | T. C. Humphreys.. | ,, 28, 29 |
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VOL. XXXI PART 2. FEBRUARY 2, 1920.

*Agricultural Gazette of New South Wales.*

# Farmers' Experiment Plots.

## WINTER FODDER TRIALS, 1919.

### Upper North Coast District.

W. D. KERLE, Assistant Inspector of Agriculture.

ARRANGEMENTS were made by the Department of Agriculture last season for trials with winter fodders in the Upper North Coast district, in co-operation with the following farmers:—

F. J. Giblin, Burrapine, Nambucca River.
Ernest Green, The Risk, Kyogle.
Ernest Grenier, Ayrshire Park, Coramba.
Jas. O'Keefe, Wooroowoolgen, *via* Casino.
Chas. Oliver, Yorklea, *via* Casino.
E. Amps, Camira Creek, *via* Grafton.
F. Allard, Brooklana, Eastern Dorrigo.
F. T. Johnson, Condong, Murwillumbah.
Geo. Forrest, Coraki.
L. H. Bull, Fairy Hill, *via* Casino.

The season was one of the most disastrous on record, and results worthy of note were only obtained in the first three cases. At Wooroowoolgen the day following sowing the plots were covered by flood waters, which remained long enough to cause the seed to rot in the ground; while at Yorklea, Camira Creek, and Brooklana the plots, which were sown chiefly on poor ground, failed to produce anything worth harvesting, the absence of rain being responsible for a poor, spindly, stunted growth. Sowing at Condong, Coraki, and Fairy Hill was not possible owing to the persistent dry weather preventing the cultural operations necessary for the production of a satisfactory seed-bed.

As already stated, the season was one of the worst experienced in the history of the district. The drought of 1918–19 culminated in heavy falls of rain in March and the succeeding two months, preventing tillage operations on most soils. From May until the plots last sown were harvested, the rainfall was very light, and the yields were high in comparison. Severe frosts in the winter and an almost rainless spring, with strong, drying winds, contributed largely to the falling off of the yields.

The amounts of rainfall which could possibly have benefited the crop, or had any effect on the yield of greenstuff were:—268½ points at Burrapine, 467 points at The Risk, and 471 points at Coramba. The soil preparation in all cases was limited by the weather conditions. The experiments at all three places followed a crop of early maize. Only one ploughing was given at Kyogle and Coramba, followed by a harrowing, the seed later being broadcasted and disced in. At Burrapine two ploughings were given, and

several harrowings, the seed being broadcasted and covered with the harrows. The amounts of seed sown per acre were:—

Wheat, 2 bushels; oats, 2 bushels; wheat and peas, wheat 1½ bushels, peas ½ bushel; field peas, 1 bushel; Black Winter rye, 2 bushels; Skinless barley, 2 bushels (with peas, 1½ bushels).

The yields per acre obtained from the three centres are tabulated as follows:—

| — | Burrapine. | | | | The Risk, Kyogle. | | | | Coramba. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of Sowing— | June 23, 1919. | | | | April 17, 1919. | | | | April 22, 1919. | | | |
| Effective Rainfall— | 268¼ points. | | | | 467 points | | | | 471 points. | | | |
| Fodder Crops. | Yields per acre. | | | | | | | | | | | |
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Huguenot Wheat and Tick Beans ... | 15 | 3 | 0 | 0 | ......... | | | | ......... | | | |
| Huguenot Wheat and Grey Peas ... | 14 | 10 | 0 | 14 | 8 | 5 | 0 | 0 | 8 | 15 | 3 | 4 |
| Huguenot Wheat and Egyptian Peas | 13 | 8 | 3 | 16 | ......... | | | | ......... | | | |
| Grey Field Peas ... ... ... | 14 | 8 | 0 | 11 | Frosted. | | | | 8 | 0 | 3 | 11 |
| Egyptian Field Peas ... ... | 13 | 13 | 2 | 22 | ,, | | | | 8 | 6 | 1 | 5 |
| Canada Field Peas ... ... ... | 12 | 0 | 0 | 9 | ,, | | | | 6 | 0 | 1 | 15 |
| Blue Field Peas ... ... ... | ......... | | | | ,, | | | | 6 | 2 | 2 | 21 |
| Skinless Barley and Canada Peas ... | 12 | 9 | 2 | 21 | ......... | | | | ......... | | | |
| Black Winter Rye and Canada Peas | 9 | 12 | 0 | 8 | ......... | | | | ......... | | | |
| Firbank Wheat ... ... ... | 10 | 1 | 2 | 19 | 5 | 8 | 2 | 25 | 6 | 10 | 2 | 27 |
| Cleveland Wheat ... ... ... | 8 | 12 | 3 | 13 | 7 | 10 | 1 | 22 | 7 | 4 | 1 | 19 |
| Thew Wheat ... ... ... | 9 | 16 | 3 | 14 | 8 | 4 | 0 | 20 | 6 | 12 | 3 | 12 |
| Warren Wheat ... ... ... | 8 | 8 | 0 | 7 | ......... | | | | 7 | 0 | 1 | 24 |
| Huguenot Wheat ... ... ... | ......... | | | | 6 | 12 | 3 | 26 | 6 | 0 | 2 | 18 |
| Clarendon Wheat ... ... ... | 7 | 14 | 1 | 10 | 5 | 2 | 3 | 16 | 7 | 15 | 3 | 0 |
| Florence Wheat ... ... ... | 7 | 10 | 0 | 11 | 5 | 1 | 2 | 19 | 7 | 3 | 3 | 12 |
| Bomen Wheat ... ... ... | 8 | 3 | 1 | 1 | 6 | 0 | 1 | 14 | 6 | 2 | 1 | 0 |
| Black Winter Rye ... ... ... | 7 | 13 | 2 | 17 | 5 | 14 | 2 | 13 | 8 | 17 | 0 | 14 |
| Algerian Oats ... ... ... | ......... | | | | 10 | 0 | 1 | 7 | 7 | 14 | 1 | 23 |
| Sunrise Oats ... ... ... | ......... | | | | 9 | 8 | 1 | 11 | 8 | 5 | 1 | 6 |
| Ruakura Oats ... ... ... | ......... | | | | 8 | 6 | 2 | 17 | 6 | 2 | 1 | 14 |

The manurial trial at The Risk and Coramba gave the following results:—

| — | Kyogle. | | | | | Coramba. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Trial conducted with— | Thew wheat. | | | | | Algerian oats. | | | | |
| Date of Sowing – | April 19, 1919. | | | | | May 15, 1919. | | | | |
| Fertiliser. | Amount of fertiliser per acre. | Yields per acre. | | | | Amount of fertiliser per acre. | Yields per acre. | | | |
| | lb. | t. | c. | q. | lb. | cwt. | t. | c. | q. | lb. |
| Superphosphate ... ... ... | 65 | 8 | 18 | 1 | 11 | 1 | 7 | 0 | 3 | 12 |
| Superphosphate ... ... ... | ...... | ......... | | | | 2 | 8 | 12 | 2 | 20 |
| P7 (superphosphate 1, bonedust 1)... | 45 | 8 | 5 | 0 | 14 | 2 | 7 | 16 | 0 | 19 |
| P8 (superphosphate 1, blood and bone 1). | 45 | 9 | 0 | 3 | 24 | 2 | 8 | 5 | 2 | 23 |
| M5 (superphosphate 2, sulphate of ammonia 1). | 30 | 8 | 12 | 2 | 27 | 1½ | 7 | 19 | 2 | 4 |
| No manure ... ... ... ... | ...... | 8 | 4 | 0 | 20 | ...... | 7 | 14 | 1 | 23 |

**Cultural Notes and Comments.**

*Burrapine.*—Soil, alluvial loam, typical of the district's river flats; plot sown, 23rd June; germination satisfactory, but stooling poor, owing to subsequent dry weather. When in ear, the Huguenot wheat was 6 feet high; Cleveland, Firbank, and Thew, 4 feet 9 inches; Black Winter rye, 5 feet 3 inches; and the vines of Egyptian field peas, 8 feet, Grey field peas, 7 feet 6 inches, and Canada field peas, 6 feet in length when in flower.

Rust did not make its appearance in the crop; black aphis seriously damaged the head of Skinless barley when "peeping," but confined its attack solely to that crop. The highest yields were obtained from the plots of Huguenot wheat, with Tick beans and Grey field peas respectively. Although the beans produced a greater weight of greenstuff, they are not so satisfactory as field peas, being comparatively coarse and woody, and not so palatable to stock. The effect of feeding field peas to the dairy herd is an almost instantaneous stimulation of the milk flow; this is not so marked with Tick beans. The varieties of field peas under trial gave particularly good yields. Egyptian—the broad-leafed, luxuriantly growing variety—proved only slightly inferior to the deservedly popular Grey of approximately the same maturity. Canada (a small podded variety, more of a dwarf, but much earlier) gave a very excellent return, particularly as the season favoured late maturing fodders. The wheat varieties gave very satisfactory returns considering the unfavourable season, Firbank providing early feed for the dairy herd, which was thereafter sustained by Thew, Warren, and Bomen, the late maturing Cleveland carrying the feeding into late November. Black Winter rye also yielded well, but it is not relished by stock to nearly the same extent as the rest of the fodders under trial.

*Coramba.*—Soil, alluvial flats of medium fertility and typical of the locality; germination excellent. The heaviest weight of green fodder was obtained from Black Winter rye, which grew to a height of 6 feet 6 inches. This was closely followed by Huguenot wheat and Grey peas, the legume making particularly good growth. This combination is a much more desirable fodder than rye; it is one that usually gives the highest yield in trials on the coast, and is much favoured by stock. Of the varieties of field peas, Egyptian made the greatest growth, and out-yielded the other three. Clarendon, a comparatively new crossbred wheat that is proving its suitability to coastal conditions of soil and climate, gave the best results where wheat was sown alone, followed by Cleveland, the latter several weeks later in maturity. The other wheats also did surprisingly well, though Thew gave a lower yield than is usually expected from that favourite coastal variety. Of the oat varieties, Sunrise provided excellent early feed, and gave the highest yield. Ruakura was disappointing, coming into ear when 18 inches high, and exhibiting a good deal of rust. The manurial trial with Algerian oats was sown on 15th May, an application of 2 cwt. superphosphate per acre proving the most beneficial and payable. In such a dry season applications of fertilisers, particularly of insoluble ones like bonedust, do not show such marked increases, owing to a big percentage being undissolved.

*The Risk.*—The alluvial soil in the creek valleys of the upper reaches of the Richmond River is exceedingly fertile and, given a decent rainfall, produces summer and winter fodders of exceptional luxuriance. When the rainfall falls far below the average, the crops are correspondingly light. At The Risk, and in the Kyogle district generally, the past season has been as dry as elsewhere, and the yields of green winter fodder high for such adverse conditions. Heavy frosts also were experienced, three consecutive ones of exceptional severity destroying the plots of field peas and causing a considerable check to the cereals. The greatest bulk of fodder was harvested from the oat plots, Algerian heading the list with a yield of 10 tons to the acre, with Sunrise 12 cwt. behind, but over a ton in advance of Ruakura. Thew wheat yielded very well, Cleveland proving the next best, and the remainder showing a decided falling off.

In the manurial trial with Thew wheat, sown 19th April, the greatest increase attended the use of P8, which yielded 17 cwt. more than the unmanured plot. Although all fertilised plots gave increases, the difference was not sufficient to pay for the cost and cartage of the manure applied. It must be remembered, however, that the season was an abnormally dry one, and the soil a fertile alluvial loam, where big increases could not be expected, particularly as it is comparatively newly cultivated, and retains much of its virgin fertility.

**Summary.**

Trials of winter fodders have been conducted by the Department in co-operation with North Coast farmers for the last ten years, with a view of popularising their cultivation and determining the most suitable crop or combination of crops for the production of winter feed. The results to date have proved beyond doubt that there are a variety of feeds that can be grown successfully and economically, even in an abnormal season such as the one under review.

It is extraordinary that despite the oft-repeated recommendations and experimentation of the Department, so few farmers grow winter fodders, or, for that matter, fodder of any kind in sufficient quantity for their dairy stock. The result is inevitable—a dry time comes, the grass paddocks give out, and the herd has to be fed on hay, chaff, &c., at ruinous prices, or—as was the bitter experience of many this season—not at all. In the majority of cases the growth of fodders would have meant the salvation of the herd, and substantial cream cheques instead of big feed bills, for there are very few farms that have not the requisite cultivation to produce at some time of the year some form of fodder that could be conserved in the form of hay or ensilage in sufficient quantity to tide over the period of drought. The rainy period on the North Coast is usually the summer, and it is very seldom that high-yielding crops of maize and sorghum cannot be grown. Where the farmer cannot afford the expense of a silo, it is recommended that he adopt the stack system described in the *Agricultural Gazette* of November—a system requiring no skill in stack building, and in which the percentage

of waste is reduced to a minimum. Notwithstanding that a number of the plots in the district failed last season, it is abundantly evident that heavy rains are not necessary to ensure profitable crops of valuable fodders for the winter. All these fodders are relished by stock, whether fed green or as hay or ensilage.

The combinations of cereals with legumes have given the best results over a number of years, and are also higher in nutritive value, the addition of the nitrogenous field pea producing a more balanced ration. The wheats particularly recommended for this purpose are Huguenot and Thew, the oats Algerian and Sunrise, with Grey or Egyptian field peas. For the production of early green feed, the quick-growing varieties Firbank and Florence are recommended, and for late feed, Cleveland.

It is to be hoped that the cultivation and conservation of these and summer fodders will become general farm practice on the North Coast. It is only thus that droughts such as have been experienced during the last two years (and which are unfortunately becoming more and more prevalent) can be combated, and dairy-farming placed on a sound basis.

## South Coast.

R. N. MAKIN, Inspector of Agriculture.

THE following farmers assisted the Department in conducting the plots :—

L. B. Garrad, Milton.
J. Chittick, Kangaroo Valley.
J. H. Martin, Pambula.
J. Timbs, Albion Park.
H. Stone, Wollongong.

In most places the rainfall at sowing time was adequate for a successful germination; the sowing was principally carried out during April. Good rain fell in May, but with this the ground got cold and the growth of the young plants was not as good as desired. From this time on to harvest a very dry spell was experienced; frosts were few in number, but were more severe than have been experienced for many years.

Wheat crops matured earlier than the early maturing oats this season. In former years it frequently happened that Sunrise oats ran into ear as soon as, and sometimes earlier than, the early wheats; but this season favoured wheat, and envious eyes were turned on wheat plots in those districts where provident farmers had followed the lead of the experiments demonstrating the value of sowing early maturing varieties of wheat for green feed. The ground in every case had received an early preparation by ploughing and harrowing early in the year, and then another ploughing prior to sowing. On each plot the seed was sown broadcast at the rate of 2 bushels per acre; superphosphate was broadcasted at the rate of 2 cwt. per acre, seed and manure being harrowed in.

The plots at Albion Park, Pambula, and Kangaroo Valley were situated on rather flat ground, whilst those at Milton and Wollongong were on hillsides; it is generally found that wheat crops do best on the warmer, drier soils such as gentle slopes on hills, whilst oats do best on the stronger lowland soils, which hold more moisture.

Quick-growing varieties of wheat, oats and barley are of much value to the dairy farmer in sustaining the milk yield during the winter months. As a rule, he is able to provide green sorghum until June, but after that until October—unless he makes silage or grows winter cereals—he has to put his hand in his pocket and purchase chaff and bran. There are now quite a number of farmers who regularly sow early maturing varieties of wheat and oats for green feed, and of late years—since Sunrise oats was introduced—many farmers have given up growing wheat and confine themselves to that quick-growing variety of oats. But the practice is not to be commended. Wheat will withstand dry weather conditions better than oats, while under ordinary weather conditions there is not much to choose between the two. Plots of both wheat and oats are recommended. Where farmers mostly make a mistake with wheat for green feed is in letting it get too old before cutting; it then becomes rather hard in the stem and stock do not relish it, whereas if it were fed to the cattle when the ear has shot it would be found more palatable. Another frequent mistake is the sowing of too large an area at a time; it is far better to make sowings at intervals of a fortnight of areas likely to meet the need, so that a succession of palatable crops may be obtained.

## Wheat Varieties Tested.

Of the varieties under test, in the wheat section Thew held its own on all plots; whilst not quite as early as Florence and Firbank, it generally yielded better than either of these varieties. At Pambula an excellent cut of over 8 tons per acre was obtained; and at Albion Park, at a time when the district was suffering on account of the dry weather and crops were backward, Thew returned 6 tons 17 cwt. odd after occupying the ground a little over three months. This wheat has now stood the test for over ten years on the South Coast, and can be recommended to the farmers with every confidence, providing the proper care and preparation is given the ground prior to planting. The old " slap-dash " style of ploughing just before sowing, throwing the seed on and harrowing it in is of no use. An early preparation is recommended—in January at the latest. Weed growth must be kept down by cultivation, and another ploughing given in March (not before the middle of that month); the seed should then be sown—with the drill for the best results. After germination the crop should be harrowed.

Florence and Firbank wheats have also been under test for many years, and have proved of high value for green feed; like Thew, these are varieties which may be purchased on the open market. Bomen (new to the South Coast) did not mature as early as the other varieties, but proved a very good

green fodder wheat, and in a better season may outyield the other varieties mentioned. Canberra was under test at Pambula, and yielded well; this also requires further test.

### Oats on Trial.

In the oat section the yields were low in comparison with those obtained for many years past. As already indicated, the season was better suited to wheat than oats. The season was also remarkable in that rust was more in evidence than for many years past. For instance, Ruakura in almost every plot rusted badly, and at Wollongong this variety and Algerian were so badly rusted as to be not worth cutting. Even at Milton, where Ruakura yielded highest of all sections, it was very badly affected by rust; the trouble came late in the growth of the plants—otherwise they might have resisted it. Algerian seems to have lost its rust resistance, as it now rusts badly in most of the South Coast districts, and generally exhibits evidence of the affection early in the season. Sunrise, whilst not rust proof, is generally rust escaping on account of its rapid growth. Some farmers have suffered loss with it through rust, but this is generally brought about by too early sowing; sowing before the middle of March is to be strongly condemned, as the heat in the ground then forces the plant to throw up a seed head when only a few inches high, and plants of wheat or oats so sown may often be found in ear in April or May. Sunrise is a very valuable oat, and is largely required by South Coast farmers for sowing for green feed. Unfortunately the supply is not yet up to the demand. Ruakura is a better stooler than Sunrise, and in some parts is well liked; but the present indications are that when the supply of Sunrise becomes sufficient to meet requirements, Ruakura and Algerian will be little grown.

Barley plots were again established in order to test the new variety, Cowra No. 36. This variety is a type of Cape barley. Experiments so far show that the new variety matures earlier than Cape, and in many cases proves better as regards weight of green feed. The past season was not a favourable one for barley, and it is hoped that the coming one will be more favourable for comparative tests. Following are the results of the trials :—

| Variety. | Milton. | | | | Kangaroo Valley. | | | | Pambula. | | | | Wollongong. | | | | Albion Park. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Wheat— | | | | | | | | | | | | | | | | | | | | |
| Firbank ... ... | 5 | 15 | 2 | 24 | 5 | 1 | 1 | 20 | 6 | 5 | 2 | 24 | 6 | 5 | 2 | 24 | 5 | 14 | 1 | 4 |
| Florence ... ... | 4 | 8 | 2 | 8 | 4 | 8 | 2 | 8 | 8 | 1 | 1 | 20 | 6 | 17 | 0 | 16 | 6 | 0 | 0 | 0 |
| Bomen ... ... | 6 | 5 | 2 | 24 | 4 | 5 | 2 | 24 | ......... | | | | 3 | 12 | 0 | 16 | 5 | 0 | 0 | 0 |
| Thew ... ... | 6 | 17 | 0 | 16 | 6 | 5 | 2 | 24 | 8 | 2 | 3 | 12 | 5 | 14 | 1 | 4 | 6 | 17 | 0 | 16 |
| Canberra ... ... | ......... | | | | ......... | | | | 6 | 17 | 0 | 16 | ......... | | | | ......... | | | |
| Oats— | | | | | | | | | | | | | | | | | | | | |
| Sunrise ... ... | 9 | 15 | 2 | 24 | 6 | 17 | 0 | 16 | 7 | 12 | 3 | 12 | 4 | 0 | 0 | 0 | 6 | 4 | 1 | 4 |
| Ruakura ... ... | 10 | 10 | 0 | 0 | 8 | 11 | 1 | 20 | ......... | | | | (Failed.) | | | | 4 | 11 | 1 | 20 |
| Algerian ... ... | 7 | 2 | 3 | 12 | 5 | 14 | 1 | 4 | 7 | 5 | 2 | 24 | (Failed). | | | | 4 | 2 | 3 | 12 |
| Barley— | | | | | | | | | | | | | | | | | | | | |
| Cowra 36 ... ... | 7 | 10 | 0 | 0 | 5 | 11 | 1 | 20 | 6 | 0 | 0 | 0 | 6 | 19 | 0 | 16 | 5 | 18 | 2 | 8 |
| Cape ... ... | 6 | 14 | 1 | 4 | 3 | 0 | 0 | 0 | 6 | 8 | 2 | 8 | 4 | 14 | 1 | 4 | 6 | 8 | 2 | 8 |

## Elephant Grass in Elevated Localities.

It is not many years since the Department first discovered for local farmers the qualities of Elephant grass as a fodder, and the months still bring reports of the behaviour of the crop under varying conditions which add to our knowledge of its utility. Mr. J. H. Curran, of Copeland, near Gloucester, lately reported that he raised a crop from a hundred plants obtained from Grafton Experiment Farm on 14th September, 1919. In reference to the remarks in a recent issue of the *Agricultural Gazette* that the land should be "not too elevated," Mr. Curran wrote: "Well, I am up 2,700 feet and this is the result. So far, in brush land, seventy out of a hundred plants grew. There was no rain until about 12th November, when we got 2 inches. I had given the plants about a quart each at planting, and altogether they have had about 4 inches since planting. They have stooled out up to eighteen stools from a plant, the average being about twelve stools and the growth to date 3 feet 10 inches. This land was not manured or cultivated, and the plants were just put in holes made with a mattock, but I have already taken about 400 plants from them (rootlets) and put them out in the creeks, and they are all showing well. I consider that there is no grass to equal it for growing, and I am experimenting with about sixteen different varieties. When I received the plants they had no sign of growth and looked like last year's maize stalks. I am well satisfied with the results so far, and will let you know further results later regarding growth, &c., as I do not intend to cut it or eat it down until April."

## Two New Canadian Wheat Varieties.

The attention of the Department was directed a couple of years ago to two new Canadian wheats, Kitchener and Red Bobs, by a reference in a local newspaper. Small packages of seed were kindly supplied by the breeder, Mr. Seager Wheeler, Saskatchewan, Canada, and the past season's experience has enabled some idea to be formed of their characters.

Kitchener is a selection from Marquis, and is said to have yielded up to 82 bushels per acre in Canada; Red Bobs is also a Canadian wheat, but the pedigree is unknown here. Kitchener comes into head at the same time as Marquis and yields rather better than that variety. It has a beardless white ear (tip-bearded) and purple straw. The grain is red, hard, and apparently of good milling quality. It is doubtful whether it yields sufficiently well for our conditions, and another trial will be made next season.

Red Bobs comes into ear six days before Marquis and resembles Bobs a good deal, the ear being open, white, and tapering but bold, and the grain red, hard and of apparently good milling quality. It seems likely to shatter, though this did not occur during the present season. It is quite likely that this wheat will yield about the same as Bobs, but another trial will be made next year comparing it with that variety.

These two varieties seem to be superior to Marquis, but further tests are necessary to determine whether they should be tried in farmers' experiment plots.—J. T. Pridham, Plant Breeder.

# The Honey Locust Tree

(*Gleditschia triacanthos* Linn.).

## Shelter, Shade, and Food for Pigs.

H. W. POTTS, Principal, Hawkesbury Agricultural College.

There are many economic phases of pig-raising peculiar to our climate, and the provision of shade and shelter during extremes of heat in a rational manner is an important one. Observations in this direction have been continuous for the past ten years at our stud piggery, and the experience has proved highly satisfactory.

Pigs revel in shade during the summer months, when the heat of the sun at midday is at its height, and continually take to shady spots. This is specially observed with white breeds. It has been noticed that where shade is not provided the animals do not thrive so well, the daily increase in weight being reduced, and the object of fattening being defeated by the absence of this common-sense necessity. Similar results are obtained when pigs are not afforded shelter during the winter months Protection from prevailing cold winds, storms and rain is economically essential.

**Young Honey Locust Tree.**
**Pruned and shaped in winter.**

Amongst the numerous trees and shrubs that have been tested, none has proved so useful as the Honey Locust Tree, sometimes known as the Thorny Locust Tree, or the Triple-thorned Acacia. It is a native of the south-eastern portion of the United States of America, and extends west to Texas. It is deciduous, hardy, long lived, and drought resistant. These trees grow to a height of 140 feet and 6 feet in diameter, but the general average will range from 40 to 50 feet in height and from 2 to 4 feet in diameter. A tree at this College planted in 1910 is now 30 feet high, and 4 feet from the ground it is 2 feet in diameter. The Honey Locust Tree is a vigorous grower, flourishes on all classes of soil, and is not subject to attacks of borers or insects. The wood is heavy, hard, strong, coarse, and durable; it can be used for fencing posts and in the construction of floors or buildings demanding damp-resistance, and it makes good fuel.

The tree has also acquired a reputation in several countries for street planting. Many of our returned soldiers will recall the splendid specimens growing in the streets of Port Said and other towns in Egypt, where the shade afforded by them is highly appreciated. As street trees they are planted 40 feet apart, and by annual trimming and pruning they are kept shapely so as to throw a delicate shade all round the stem for 20 feet, the handsome light green foliage affording a picturesque effect. When planted in a yard or area alone, the height can be kept low, the branches allowed to spread out,

**A tree planted in 1912, and pruned to throw a good shade in spring.**

and the foliage trimmed to be light or heavy. Thus the trees lend themselves to a variety of uses from a shade and shelter point of view.

They can be planted as wind breaks about 6 feet apart or used as hedges, in which case the young plants can be grown from 18 inches to 3 feet apart, according to the class of stock it is proposed to enclose. The same method applies where a garden hedge is being planted. The strong sharp thorns growing on the stems are sufficient to prevent any class of stock breaking through, and the excellent shelter and shade afforded by this class of hedge in summer is readily seen where pigs are kept. It has, too, a most attractive and charming appearance, affording a pleasing and graceful outline to any homestead. The

oliage is a light green, and its appearance in the spring is followed by the handsome purple blossoms, which contain a quantity of nectar that attracts bees in large numbers.

In early autumn the long, broad, locust beans are very prominent as the foliage falls. At first the pods are brown, but they steadily darken to a black colour, finally becoming dry and eventually falling. In the early stage the pods contain a soft, edible, sweet pulp, but at any stage of ripeness they

**A tree planted in 1910, showing a good crop of edible beans in winter.**

**The same tree pruned and shaped after the beans have been eaten.**

are promptly eaten as they fall by pigs of all ages. A strict watch has been kept at this institution in order that any symptoms of digestive disturbance following consumption of the pods might be noted. So far nothing has occurred to show that these beans are not nourishing and edible. Confidence was established at the initiation of the test by a perusal of Gray's "Supplement to the Pharmacopœia," edited by Professor Redwood and published in 1845. On page 261 is a description of the tree and the statement "the seeds are used to feed animals and the sap yields sugar." An average sample of the

bean was sent to the Department's chemist, Mr. F. B. Guthrie, F.I.C., who furnished the following analysis :—

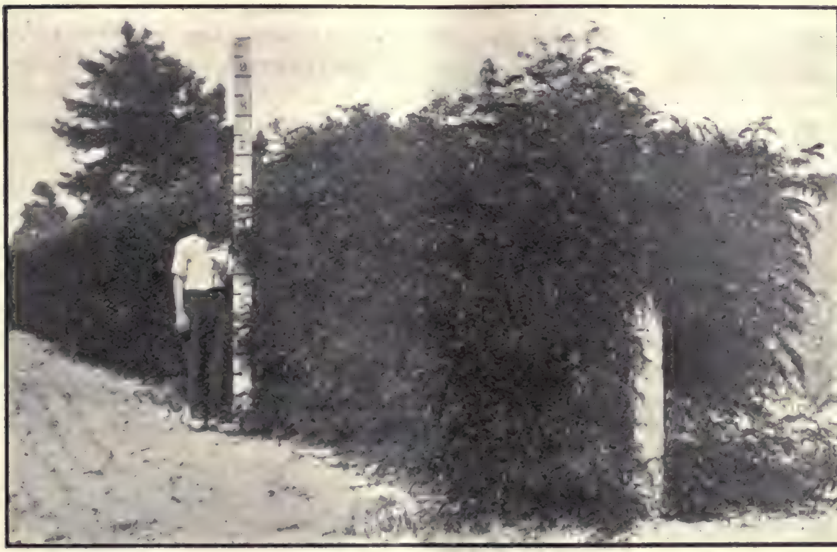
| | Per cent. |
|---|---|
| Moisture... | 7·66 |
| Albuminoids | 13·22 |
| Ether extract | 1·76 |
| Fibre | 17·03 |
| Carbohydrates | 56·13 |
| Ash | 4·20 |
| | 100·00 |
| Albuminoid ratio | 1 to 4·5 |
| Nutritive value... | 73·3 |

**A Hedge planted in 1907.**

The leaves have fallen, exposing the formidable thorns that prevent stock from breaking through.

In this connection the beans contrast favourably as food with pollard, bran, coconut cake, linseed, maize, peas and barley.

After the leaves and beans have fallen in winter the hedge or tree can be cut, trimmed or pruned to any height, size or shape required. The deciduous character of the foliage is a distinct advantage in the use of this



Hedge in full leaf in spring.

Another view of the same hedge, after pruning in the autumn.

plant as hedge or tree in a pig yard. The leaves falling allow the sunlight to reach the soil on which the pigs have lain during the summer, and any parts which may have become foul and unhealthy are subjected to the disinfecting and sweetening influences of the sun's rays. All contaminating and decomposing matter is thus destroyed, moulds and bacteria on the surface are rendered harmless, and the area is made healthy for occupation in the same way the following season.

These trees are readily propagated from the beans, taken from the blackened pods in winter. The seeds should be stored in a dry place until ready for sowing, and prior to sowing in the early spring they should be soaked in water at a temperature of 150 degrees Fah. for a few hours, to assist and hasten germination. Sow in a light loam, fairly damp, in a shaded corner of the garden. The seeds germinate freely and the plants grow with great vigour, so that when twelve months old they can be planted out in their permanent locations. Many trees raised from seed are found to be thornless, and these may be especially selected for decorative or shade purposes.

We thus find that this handsome shade tree is not only a valuable addition to our native trees for purposes of shade and decoration, but that it possesses the additional advantages of providing food for stock, pigs and bees, as well as (by its deciduous habit) giving a sweetened and healthy soil surface for resting stock.

## What Departmental Help Stands For.

The substantial benefit the farmer may derive from the activities of an Agricultural Department has been recently instanced in the water-melon industry in the south-eastern United States, where (according to the "Weekly News Letter" of the U.S. Department of Agriculture) losses were reduced from 20 per cent. in 1918 to 2 per cent. in 1919 as a result of the treatment of the stems of water-melons against stem-end rot.

The enormous loss that was going on made it obvious that the water-melon industry in the area in question was threatened with extinction by reason of the one disease alone, and a campaign for the control of the trouble was started in the spring of 1919 under the supervision of the Washington Department. It was found that a large percentage of the losses occurred among melons that had been infected at the cut stem after they had been removed from the vine, and that disinfection of the cut stems at the time of loading the melons into cars would eliminate much of the waste. The method adopted was to cut off a section of the stem as the melons were packed into the cars and to apply a small brushful of disinfectant paste to the freshly cut surface.

As indicated, losses were quickly curtailed. Particular evidence as to the efficacy of the treatment was offered by comparison of the melons in two halves of one car load, one half being treated and the other untreated. An examination at the conclusion of the journey disclosed only 4 per cent. of the melons in the treated half to be decayed while in the untreated half 28 per cent. were affected.

# French Potash-salts.

F. B. GUTHRIE.

THE first consignment of potash-manure from Alsace has recently been landed and is now available for farmers. It is consequently an opportune time to say a word or two concerning this product, especially as some misconception exists as to its value as a fertiliser.

Hitherto, or before the war, the supplies of potash manures imported into this country, and indeed into nearly every other country, were obtained from the Stassfurt deposits in Germany. A considerable variety of potash salts was derived from these enormous mines, of which kainit, sulphate of potash, and muriate of potash were the principal. As far as we were concerned locally, the importations of recent years were almost exclusively confined to sulphate of potash, kainit (the lower grade) being relatively more expensive, and the sulphate being more readily obtainable and cheaper than the muriate. Probably this latter state of things was merely a trade convenience, since the muriate is the principal potash-salt used as a fertiliser in Great Britain and the United States, and perhaps in some other countries. It appears to be not unlikely that the shipping of sulphate of potash to Australia was encouraged in order to find a convenient market for it. The position now is, that having been without potash-salts for the past five years, the requirements in this direction are being met by importations of potash manures from Alsace.

The salts obtainable from this source are sylvinite and muriate of potash. Muriate of potash is the trade name for potassium chloride, sylvinite being potassium chloride mixed with other salts which are removed in the preparation of the muriate. As muriate of potash is the name under which it will apparently be most familiar, that name will be adhered to in these notes.

Sylvinite is the raw product of the mines and is obtained in two grades, one containing 14 per cent. potash, known as French kainit, and the other containing 20 per cent. potash and known as French manure salts.

Muriate of potash is the above crude salt purified until it is nearly pure muriate of potash, containing 50 to 60 per cent. potash. It is this latter salt which constitutes the present consignment, and which will probably be in the future, or at least for a considerable time, the only potash salt available to the farmers of this country.

This muriate is sold in two grades—A, containing 52 per cent. potash, and M, containing 58½ per cent. potash. Grade A contains practically identically the same percentage of potash as the sulphate, and can replace it in manure-formulæ, weight for weight.

It is important to bear in mind that the whole difference between the present supply and the product with which we had previously to deal, is that

the German product was potassium sulphate, whereas the French product is potassium chloride (muriate). As a good deal of misconception exists as to the relative manurial values of these two salts, and as we shall no doubt be confronted with much theoretical discussion concerning the action of chlorides and sulphates on soil and crop, it will be as well to summarise shortly what is known of these substances.

It must be premised that the New South Wales Department of Agriculture has no practical experience in manuring with the muriate, for the reason, already stated, that practically the only potash-salt available for manuring hitherto has been the sulphate.

The salt principally used in Great Britain and the United States is the muriate, the main reason being undoubtedly that this is the cheapest form in which potash is obtainable. Locally, up to 1904, muriate of potash was sold on a guarantee of 57 per cent. potash, and cost £13 15s. per ton. Sulphate of potash with a guarantee of 52 per cent. potash was sold at £13 10s. per ton. This would make the unit-value of potash in the muriate 4s. 10d. as against 5s. 2d. in the case of sulphate—a difference of 4d. per unit in favour of the muriate. For some reason, possibly for the one already suggested, after this date shipments of potash salts were confined to the sulphate. Up to 1915, sulphate of potash, with a guarantee of 52 per cent. potash, was quoted at £14 10s. per ton, being a unit value of 5s. 7d. Muriate was not then quoted at all. Since 1915 no potash-salt has been obtainable until now.

As inquiries are constantly made as to the value of muriate as a fertiliser, and as it is being stated in some quarters that it compares unfavourably with sulphate, it may be as well to state definitely that while the Department is unable to speak from actual experience of the muriate, there is no reason whatever to anticipate that the muriate is any way inferior to the sulphate, still less that it is likely to have any injurious action on ordinary crops, as has been suggested by some.

It is the principal potash-salt used in agriculture in some countries, it is cheaper than the sulphate, and in any case, it is the only one likely to be available locally for some time. It is stated also that it diffuses more readily in the soil than the sulphate, in other words, that it is more rapid in its action.

On the other hand, it must be admitted that most writers on the subject affirm that it reduces the market-value of tobacco and potatoes. The most definite statement of the limitations of muriate of potash as a fertiliser that I have been able to find is made by J. E. Halligan, chemist in charge of the Louisiana Experiment Station, in his book, "Soil Fertility and Fertilisers" (1912). He states that tobacco, potatoes, sugar-beets and oranges are crops that do not do well on large quantities of this fertiliser. The presence of chlorides is regarded as objectionable in the case of these crops; in the case of tobacco the burning quality of the leaf is affected, while potatoes are said to be made "waxy."

With these possible exceptions, muriate of potash can be used instead of sulphate on all classes of crops, and it may be found by experience that the ill-effects noted in other countries on the particular crops mentioned may be absent under our own conditions.

The output of Alsatian potash during the first six months of 1919 was as follows :—

| | | |
|---|---|---|
| Sylvinite (French kainit) | 12 to 16 per cent. potash | 77,055 tons. |
| ,, ,, | 20 to 22 per cent. potash | 40,048 tons. |
| Potassium chloride (muriate) | 50 to 60 per cent. potash | 14,428 tons. |

The potash salts on the local market are :—

| | |
|---|---|
| A grade, 52 per cent. potash ... ... ... | £32 per ton. |
| M grade, 58 ,, ,, ... ... ... | £35 ,, |

The unit value of the potash in A grade is 12s. 3d., and in M grade, 12s. 1d.

The potash content of A grade is identical with that of the sulphate, and it can be substituted for the latter in equal proportion in any of the formulæ.

## Some Recent Publications.

Copies of the undermentioned publications may be obtained by farmers free of cost, on application to the Under Secretary and Director, Department of Agriculture, Sydney :—

Farmers' Bulletin, No. 125. The Cultivation of Maize, 43 pages; by H. Wenholz.

Farmers' Bulletin, No. 128. Wheat Handling and Grading in America, 17 pages; by E. Harris.

### Miscellaneous Publications and Leaflets.

Selecting and Judging Maize for Show.
Grasses and Clovers on the Nambucca River.
Spring Management of Bees.
The Pig Industry.
Cultivation of the Vineyard.
Some New Varieties of Wheat.
Diseases of Animals, No. 2 : Actinomycosis.
Diseases of Animals, No. 3 : Tuberculosis.
Diseases of Animals, No. 8 : Anthrax.

## The Necessity for Sound Book-keeping.

In ordinary business management a knowledge of accounts has been regarded as indispensable, and there is every reason why a proper system of accounting would be of the greatest value to agriculture. By sound book-keeping the individual farmer is able to determine and compare the results of particular branches of farming. Such information could be made of wider application if book-keeping were to be more generally practised, and would be of benefit not only to the individuals concerned, but to the general body of farmers.—*Journal of the Board of Agriculture*, England.

# The Need for Improved Methods in Handling Sheepskins.*

J. W. MATHEWS, Sheep and Wool Expert.

PERHAPS only those intimately connected with the skin trade can be fully sensible of the loss that occurs annually in this State through the indifferent treatment and handling of sheepskins. Sheep that are slaughtered at leading metropolitan abattoirs or other properly-equipped killing establishments are, of course, outside the scope of the foregoing comment; but the criticism must be regarded as generally applicable to the methods in vogue at the privately-owned properties (chiefly in the country) from which Sydney fellmongers obtain an important proportion of their supplies. As showing the extent to which wastage exists, the accompanying statement of figures is arresting. The table forms a comparison of the various lots of skins treated by only one firm of fellmongers in the city—the "dry" skins having been received from various country consignors, and the "green" skins direct from the metropolitan abattoirs. The totals and percentages given are sufficiently eloquent, but it may be mentioned that an examination of a list of individual consignments showed in one case a loss of 30 per cent. on one lot of "dry" skins, while in one consignment of "green" skins of 4,860 only five were lost. The following is a summary of the results:—

| | *Dry Skins.* | | *Green Skins.* | |
|---|---|---|---|---|
| | Sound. | Lost. | Sound. | Lost. |
| May-June Consignments ... ... | 80,423 | 12,519 | 44,807 | 169 |
| Percentage loss ... ... | 15·5 | | 0·38 | |
| January–February Consignments ... | 73,476 | 18,368 | 42,106 | 385 |
| Percentage loss ... ... | 24·99 | | 0·91 | |
| Total percentage of all Dry Skins lost ... ... | | | 20·07 | |
| Total percentage of all Green Skins lost ... ... | | | 0·64 | |

Figures to hand from the Government Statistician show that approximately 950,000 sheep, inclusive of lambs, are slaughtered on private properties annually in the country. The total slaughtering for the State during the year ending 30th June, 1918, was 3,202,178. Of this number, 1,155,322 were killed in the metropolitan area, the balance being country killed.

It has been estimated that a pelt (minus, of course, the wool) is worth on the average 1s. 8d.; an unsound one, on a similar basis of estimation, is said not to be worth more than half that value. That the loss on this account annually to the State and to the industry is very considerable it needs no extensive calculation to show.

Indeed, of such economic significance was it considered to be, that the matter was brought under the notice of the newly-constituted Bureau or

* Text of a report furnished to the Experiments Supervision Committee.

Advisory Council of Science and Industry. The co-operation of the Department of Agriculture was immediately sought for by that body, to see whether by some means or other those responsible for it could not be roused to a sense of responsibility, so that in some measure so great a waste might be reduced, if not avoided.

### Careless Methods of Treatment.

Complaint apparently does not arise from one cause alone, but from the negligent manner in which, in too many instances, the skins are handled as they are removed from the body until they reach their destination where they are finally treated. Often no provision whatever is made for drying. A little extra care would perhaps be taken of a skin that is approaching full wool; but frequently has it been noted in the case of a short growth or late shorn sheep that the pelts have been allowed to lie about and exposed to all conditions of weather. Sometimes they are carelessly thrown over a rail, woolly side out, with the result that they become heated and the texture of the pelts suffers in consequence. Frequently, too, the skins are allowed to remain until the extremities curl up, and so afford a favourable place of abode for the operations of the blow-fly. Other cases have been noted, again, where no attempt has been made to stretch the skin. If not left near the spot just where it was removed, it has been hurriedly thrown across a wire, causing it to dry out a bad shape and become creased and "ridgy."

Serious damage is often caused through cutting or scoring at the time of skinning, nor is any attempt made in many cases to protect the skin against weevils, which readily attack them, especially during the summer.

On the assumption that the wool is more valuable than the pelt, the skins are often packed flesh side out, thereby exposing it to all the damage that might be caused during transit.

### The Tests.

After full inquiry and investigation, it was decided to institute a series of tests at different experiment farms, in order to see whether, by adopting better methods, existing conditions could not be improved upon. The tests were undertaken at Hawkesbury Agricultural College and Wagga and Trangie experiment farms under the supervision of the Experiments Supervision Committee, special lots of sheep being set aside for the purpose.

Differences of opinion existed as to the respective merits of sun and shade drying. One member of the committee, Dr. Darnell-Smith, said he considered "mere drying in the sun a very bad practice. Very soon after an animal is dead, bacteria enter the skin and start decomposition, and in thick skins drying in the sun does not check them, with the result that the tissues of the hide are much integrated."

The best means of combating weevil infestation was also considered, and the application of salt in the process of curing to preserve pliability and softness of texture.

Finally it was decided to direct the test with a view to (1) ascertaining to what extent damage was done by drying in the sun; (2) discovering how skins might be preserved by the application of an approved preparation as a paint.

The following schedule of the tests will indicate the scope of the investigations :—

*Experiment A.*—Drying in the sun : After the skins are stripped, they shall be laid lengthways (head to tail) without overlapping, flesh side upwards, extremities well exposed, on half-round rafters 6 inches to 8 inches in diameter.

*Experiment B.*—Drying in shade : The same number of skins as in Experiment A, to be laid out in exactly the same manner, at the same time, and dried in a shed providing good shade, free from sun's rays.

*Experiment C.*—Painting sun-dried skins : When thoroughly dry, half the sun-dried skins to be painted with a solution consisting of 1 lb. of arsenate of soda to every 2 gallons of water, to which has been added 1 drachm bitter aloes dissolved in an egg-cup full of water.

*Experiment D.*—Painting shade-dried skins : A similar number of shade-dried skins to be painted with the solution as used in Experiment C.

*Experiment E.*—Salting and Curing : A corresponding number of skins, after flaying, to be rubbed on the flesh side with salt, then thoroughly sprayed with a 2 per cent. solution of disinfectants of the type of Lysol, that preparation being unprocurable.

### Tanning Results.

In order to carry the investigations as far as possible, the skins, in separate lots as enumerated, were forwarded for treatment to a firm of fellmongers, Messrs. Thomas Elliott & Co., who co-operated with the Department in the work. In their report they give the results of their personal observations and also set their valuation against each lot. Before proceeding to review the particulars, however, the mode of procedure in the conduct of the trials may be briefly reviewed.

The experiments were commenced about the middle of February, 1919, the skins being taken week by week, as the sheep were killed, up till about the end of July. When a suitable number had been collected in each lot they were forwarded for treatment, each lot being kept separate. Treatment consisted of fellmongering, tanning, and preparing the skins. It is not necessary to dilate upon the methods adopted by the fellmongers in preparing and classifying the skins, except to say that an equal number of skins were dealt with by the different modes of treatment and that deductions are based on the quality and value of the basils in the prepared state.

The following is a résumé of the value of the pelts in their prepared state, all fellmongering and tanning charges being deducted :—

| Consignments from— | Experiment. | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| | d. | d. | d. | d. | d. |
| Hawkesbury Agricultural College ... | 10·34 | 22·23 | 16·80 | 26·93 | 26·96 |
| Wagga Experiment Farm... ... ... | 16·15 | 25·10 | 22·00 | 26·40 | 31·40 |
| Trangie Experiment Farm ... ... | 8·00 | 12·00 | 13·92 | 16·33 | 17·00 |
| Average value ... ... ... | 11·52 | 17·74 | 14·24 | 23·22 | 25·12 |

It should be borne in mind that lots A and C and B and D were to all intents and purposes identical, except that B and D represented in each case the painted skins. On the other hand, lot E was the cured skins, as explained above.

The figures are fairly convincing, and may be accepted as a fair criterion of the merits of the respective modes of treatment. It has been amply borne out that drying in the sun is a wrong practice. It has also been made clear that painting is beneficial, as in both instances the painted skins maintained a higher range of values than the unpainted ones, indicating that there were fewer rejects among those lots.

Lot E stands out conspicuously as the highest in the list—that is, so far as the value of the pelt is concerned. It would be well, however, not to form hasty conclusions.

Commenting on the value of the skins, Messrs. Elliott & Co. wrote :—

It will be seen from the result that the skins which have been shade-dried turned out much better than those dried in the sun. Drying in the sun draws the fat to the surface and causes the grain to blister and peel, and reduces the value considerably; this would, of course, be much more pronounced in hot than in cold weather.

There is not a marked difference in the value of the B and D classes, but it must be noted that these were received and operated upon during the cold weather, when very little weevil was about; had the sheep been killed in the summer time and the skins allowed to lie about for any length of time, a large proportion of the pelts from the B class (unpainted skins) would not have been worth tanning—only fit for glue-making.

With regard to Lot E (salted and cured), we have already pointed out to you that this method of treatment produces pelts quite first class, but we cannot recommend it for the reason that we find it impossible to get the wool a good colour. It has a yellowish tint which ordinary scouring will not remove.

We very often buy salted pelts in the market, but these we can procure at from 2s. to 3s. lower than those ordinary good pelted dry skins, because of the difference in wool values.

We should like to point out that skins that are badly butchered could often be put into higher grades but for being cut. We cannot lay too much stress on this point. The pelt (now that values are ruling so high) is a very important factor, and the condition of the pelt is now very much more taken into consideration by buyers than formerly.

To sum up, we would strongly recommend that all skins be painted and shade-dried, and that special care be taken to have skins removed free from cuts.

Some years ago we were big buyers from several meat works in different parts of the Commonwealth. We always had the skins painted with a weak solution of red arsenic which, in our opinion, is the best preservative and gives the best result in pelts. We can say we never lost 2 per cent. of pelts treated in that way.

Messrs. Elliott & Co., in their report, sum up the position so clearly that it leaves very little else to be added

With regard to shade-drying it may be remarked, however, that proper provision should be made for the purpose. If an outbuilding be not available, a shed suitably designed should be made for the purpose. A long and narrow one is preferable to a wide one. If constructed to allow of three sets of beams being placed in line, say 2 feet 6 inches apart, and about the same distance from the outside, it should be wide enough for ordinary requirements. A length of about 4 feet is required properly to stretch a skin, so that the length of the building may be regulated by the number of skins it will be required to hold during any period of drying. Observations taken

during the tests showed that it usually took between two and four days to dry a skin, but this chiefly depended upon the time of the year and weather conditions. During the earlier (warmer) months about three days were occupied, but towards winter as long as eight days were required. Thus, by having the beams placed in three rows as indicated, accommodation may be provided for the regular influx, as well as the output of the skins as they reach a state of dryness.

Attention might further be drawn to the necessity of exercising due care in the stretching of the skins. To ensure this they should be placed over the beams lengthways—that is, from head to tail, and flesh side out. The rafters or beams used for the purpose should be half-round, and from 6 to 8 inches in diameter. The building should be left open on all sides to allow of free circulation of air. The roof should be angular in formation, and allowed to slope well down below the line of the outside beam. If the beams are placed about 6 feet from the ground they should be high enough. It would be well, however, to have the shed netted on all sides so as to protect the skins from marauding dogs and other pests, which often gnaw and pull them from the beams.

It has further been made evident that the best means of preserving the skins is to have them painted with a proper arsenical solution. The skins should be painted immediately they are taken off the beam. Messrs. Elliott & Co. recommend red arsenic, but the solution used in the trials seems to have given satisfaction and is widely used. It is inexpensive and is easily prepared by taking, say, 1 lb. of arsenate of soda, placing it in a bran bag and suspending it in 2 gallons of water, when it quickly dissolves. To this should be added 1 drachm of bitter aloes, dissolved in an egg-cup full of hot water. This could be used without dilution all the year round, as it is strong enough for a summer paint and will do no harm if it is stronger than is really required for the winter.

In addition to the objection raised by the fellmongers with reference to skins cured by salting, there is another which applies particularly to those intended for export. Salted skins collect moisture, and though they may be weevil proof, they are given to sweating when tightly packed.

With regard to methods of packing, it may be remarked that the skins should be folded lengthways—head to tail—as dried, and straight down the middle of the back, woolly side out; the ends should be turned in.

The consignment should not be held too long. If a sufficient number is not available to make up a fair-sized consignment, it would be well perhaps to dispose of them locally. Otherwise, repeated applications of solution will be found necessary.

# Farmers' Experiment Plots.

## Maize Experiments, 1918–19.

## Central Coastal District.

J. M. PITT, Assistant Inspector of Agriculture.

EXPERIMENTS with maize were conducted by the Department during the spring of 1918, in co-operation with the following farmers :—

R. Richardson, Mondrook, Manning River.
M. Smith, "Bona Vista," Paterson River.
W. H. Duffy, Comboyne.
G. A. Andrews, Charity Creek, Manning River.
E. L. Andrews, Mt. George, Manning River.
A. Smith and Atkins Bros., Bandon Grove, Dungog.
A. G. Fraser. "Homestead Farm," Gloucester.

The yields, whilst not as high as those of last year, were good considering the droughty conditions ruling during the spring and summer. Maize, however, is a crop that does not stand excessive moisture, especially in the early stages; under such conditions a heavy growth takes place—and this is not necessary to maximum yields; moreover, this generous growth requires a lot of moisture to maintain it later in the season, and a tendency to fungous diseases is developed. The tasselling period is the most critical in the growth of maize, and it is then and afterwards that ample moisture is required to ensure a proper pollination and filling out of the ears.

The majority of the Upper Manning, Comboyne and Dungog plots were fortunate in having useful falls at this time, thus ensuring good yields; the crops, too, were entirely free from the attacks of leaf blight. The Gloucester and Paterson plots, however, were less fortunate in respect to rain, and the results in consequence were poor. Indeed, insufficient rain fell at the former place to germinate the seed. The following figures show the rainfall over the two seasons :—

| | | Tinonee. | Paterson River. | Comboyne. | Mt. George. | Charity Creek. | Gloucester. |
|---|---|---|---|---|---|---|---|
| | | Inches. | Inches. | Inches. | | | |
| 1917–18 | First period of growth (about 3 months) .. | 15 | 4 | 11 | No experiment. | No experiment. | No experiment. |
| | Last period of growth ,, ,, .. | 12½ | 15 | 21 | | | |
| | Total .. .. .. .. .. | 27½ | 19 | 32 | | | |
| | | Inches. | Inches. | Inches. | Inches. | Inches. | Inches. |
| 1918–19 | First period of growth (about 3 months) .. | 4¼ | 2¾ | 4 | 4½ | 4¼ | 3½ |
| | Last period of growth ,, ,, .. | 6½ | 5¼ | 15 | 5½ | 5¾ | 6 |
| | Total .. .. .. .. .. | 10¾ | 8 | 19 | 10 | 10 | 9½ |

The cultivation methods adopted by the various farmers were satisfactory. Ploughing deeply in the autumn has again proved itself to be indispensable; and it is pleasing to note that most of the farmers recognise the value of allowing the land to fallow and sweeten during the winter months, giving

occasional workings to destroy weed growth and keep the surface soil loose. Others, instead of leaving the land in fallow, go in for growing field peas, vetches, &c., and either turn the whole crop under as a green manure crop, or use the growth as a soiling crop, afterwards turning the residue under. The growing of legumes—either cowpeas sown amongst the crop after the last cultivation of the maize in November, or field peas sown early in the autumn—and ploughing under in sufficient time for them to rot before the next spring crop is sown, is strongly recommended.

### The Varieties.

Improved Yellow Dent, a variety now grown extensively over the whole of the coast, again yielded consistently. This can safely be regarded as the most reliable cropper under all conditions, and, owing to its heavy yielding capacity, its rather small stalks and its capacity to maintain its sap, is preferable to other varieties for green fodder and silage. It may be mentioned that from seed originally obtained from the Grafton Experiment Farm, a Manning River farmer harvested the magnificent yield of 125 bushels to the acre, gaining first honors for the best plot of maize given by the Manning River Agricultural Society for the district. This variety matures in six months and can be sown early or late.

Other varieties to yield well in the plots were Golden Beauty, Red Hogan, Narrow Red Hogan, Golden Nuggett, Leaming, and the four white varieties, Boone County, Hickory King, Giant White and Silvermine. Red Hogan gave the highest yield, namely, 92½ bushels to the acre at Mondrook; some exceptionally fine cobs were harvested. Narrow Red Hogan created a very favourable impression in the Upper Manning, its heavy yield (84 bushels) and shelling percentage (84·8) earning for it the reputation of "a good bag filler."

The comparatively dry season on the Comboyne was responsible for some very fine yields of Leaming being harvested, and in a manurial trial nearly 69 bushels to the acre were obtained. Several other varieties were tried, but Leaming appears to be the most suitable here. Later maturing varieties have difficulty in ripening off the grain owing to the high altitude.

Owing to the high prices ruling, and the scarcity of maize that is usual towards the end of the year, a number of farmers have adopted the plan of sowing a portion of their farm to very early maturing varieties to catch this market. Golden Superb in the Macleay district has proved useful in this respect, and is being grown extensively along the Manning this season. Another variety, Brewer's Dent, yielded 67¾ bushels at Charity Creek; it matures in a little over four months. The increase obtained from stud seed over ordinary seed again shows the advantage of field selection and the growing of a stud plot. It is a pity (as the following figures indicate) this method of obtaining seed is not carried out more extensively:—

| | bus. | lb. |
|---|---|---|
| On the Comboyne, Stud Leaming yielded ... ... ... | 60 | 9 |
| ,, ,, Ordinary Leaming yielded ... ... | 51 | 31 |
| At Charity Creek, Stud Improved Yellow Dent yielded ... | 78 | 4 |
| ,, ,, Ordinary Improved Yellow Dent yielded | 72 | 0 |

### Cultural Details.

*Mondrook.*—Rich alluvial loam; previous crop maize; ploughed deeply in the early autumn, fallowed, disced, harrowed during the winter and again previous to sowing. Sown 29th September, 1919.

*Charity Creek.*—Soil, rich alluvial flat; previous crop maize, and grown continuously over twenty years; ploughed deeply, rubbish being turned under in the early autumn; fallowed during the winter; another shallower ploughing and harrowing given previous to sowing; seed sown with double-row planter (no manure) on 30th October. Sowing in September is usually practised in this locality, and the delay in the above instance was due to the non-arrival of the seed.

*Mt. George.*—Soil, rich alluvial loam; previous crop maize (for a number of years); stalks and other growth were ploughed under early in the autumn, and left in fallow during the winter; a further shallower ploughing and harrowing given before sowing; sown on 8th September with a double-row planter, no manure.

*Dungog (Bandon Grove).*—Soil, fairly heavy rich alluvial flat; previously under paspalum; ploughed during the winter and worked a number of times to clean; ploughed again prior to sowing on 1st November, 1918.

*Comboyne.*—Rich alluvial volcanic soil, on comparatively new land; ploughed in the autumn and again before sowing, with harrowings to follow; sown on 17th October, 1918.

*Paterson.*—Soil, dark alluvial flat, typical of the agricultural loam of the Hunter tributaries; previous crop maize; ploughed early in the autumn and again in the winter, with a further one with cultivation, harrowing, and rolling previous to sowing; seed sown on 28th October, 1918. This plot had an exceedingly dry time.

VARIETY Trials for Grain.

| Variety. | Charity Creek. | | | Mt. George. | | | Comboyne. | | | Paterson.* | | Mondrook. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yield. | | Shelling per-centage. | Yield. | | Shelling per-centage. | Yield. | | Shelling per-centage. | Yield. | | Yield. | | Shelling per-centage. |
| | bus. | lb. | | bus. | lb. | | bus. | lb. | | bus. | lb. | bus. | lb. | |
| Stud Improved Dent .. | 78 | 4 | 81·4 | .. | | .. | .. | | .. | 36 | 0 | .. | | .. |
| Improved Yellow Dent | 72 | 0 | 81·6 | 80 | 18 | 78·5 | .. | | .. | 38 | 2 | 91 | 14 | 84·2 |
| Woodside Dent (G. A. Andrews). .. .. | 70 | 40 | 82·2 | .. | | .. | .. | | .. | .. | | .. | | .. |
| Brewer's Dent .. .. | 67 | 43 | 77·9 | .. | | .. | 8 | 0 | 86·4 | .. | | .. | | .. |
| Craig Mitchell (White) | 67 | 46 | 79 | .. | | .. | 2 | [illegible] | 80·6 | .. | | .. | | .. |
| Leggett's Pride.. .. | 64 | 36 | 79 | .. | | .. | .. | | .. | .. | | .. | | .. |
| Silvermine (White) .. | 53 | 2 | 81·8 | .. | | .. | 25 | 40 | 75 | .. | | 75 | 15 | 86 |
| Golden Glow .. .. | .. | | .. | .. | | .. | 6 | 4 | 76·2 | .. | | .. | | .. |
| Golden Beauty .. .. | .. | | .. | 84 | 37 | 77·3 | .. | | .. | 20 | 16 | 83 | 42 | 83·4 |
| Narrow Red Hogan .. | .. | | .. | 84 | 3 | 84·8 | .. | | .. | .. | | .. | | .. |
| Red Hogan .. .. | .. | | .. | 81 | 23 | 77·4 | .. | | .. | .. | | 92 | 28 | 83·8 |
| Golden Nugget .. .. | .. | | .. | 79 | 13 | 75·2 | 50 | 0 | 84·5 | 17 | 38 | 78 | 42 | 85·2 |
| E. Andrews' Dent .. | .. | | .. | 75 | 3 | 76 | .. | | .. | .. | | .. | | .. |
| Yellow Moruya .. .. | .. | | .. | 73 | 28 | 73·6 | .. | | .. | .. | | .. | | .. |
| Yellow Horsetooth .. | .. | | .. | 71 | 36 | 82·6 | .. | | .. | 30 | 6 | .. | | .. |
| Goldmine .. .. | .. | | .. | 69 | 43 | 74·3 | .. | | .. | .. | | .. | | .. |
| Large Macleay Yellow | .. | | .. | 69 | 18 | 76·9 | .. | | .. | .. | | .. | | .. |
| Leaming .. .. .. | .. | | .. | 67 | 51 | 79·4 | 51 | 31 | 86·4 | 19 | 6 | 81 | 17 | 82 |
| Boone County (White) | .. | | .. | .. | | .. | .. | | .. | .. | | 90 | 25 | 81·5 |
| Gold Standard Leaming | .. | | .. | .. | | .. | .. | | .. | .. | | 85 | 43 | 82·1 |
| Hickory King (White).. | .. | | .. | .. | | .. | .. | | .. | .. | | 84 | 54 | 81·2 |
| Giant White .. .. | .. | | .. | .. | | .. | .. | | .. | .. | | 78 | 42 | 85·2 |
| Stud Leaming .. .. | .. | | .. | .. | | .. | 60 | 9 | 86·8 | 13 | 5 | .. | | .. |
| Small Red Hogan .. | .. | | .. | .. | | .. | 57 | 34 | 87·8 | .. | | .. | | .. |
| Brazilian White .. | .. | | .. | .. | | .. | 23 | 48 | 76·3 | .. | | .. | | .. |

* At this centre the shelling percentage was not kept.

In addition to the above a yield of 72 bushels 48 lb. was obtained from Improved Yellow Dent at Dungog. The shelling percentage was not kept.

MANURIAL Trial at Comboyne.

Variety—Leaming.

| Manure per acre. | Yield per acre. | Approximate Cost of Manure per acre. | Approximate Profit per acre. |
|---|---|---|---|
| | bus. lb. | s. d. | £ s. d. |
| No manure ... ... ... ... | 51 31 | ... ..... | ... ...... |
| 1 cwt. superphosphate ... ... | 61 41 | 5 1½ | 3 1 0 |
| 1 cwt. superphosphate, ½ cwt. nitrate of soda... ... ... | 59 27 | 18 1½ | 1 13 5 |
| 2 cwt. superphosphate ... ... | 63 36 | 10 3 | 3 8 4 |
| 2 cwt. P8 ... ... ... ... | 61 8 | 16 6 | 2 5 11 |
| 2 cwt. B. and B. ... ... ... | 61 16 | 20 0 | 2 3 2 |
| 2 cwt. P7 ... ... ... ... | 68 45 | 16 3 | 4 15 10 |

MANURIAL Trial at Bandon Grove, Dungog.

Variety—Improved Yellow Dent.

| Manure per acre. | Yield per acre. | Approximate Cost of Manure per acre. | Approximate Profit or Loss per acre. |
|---|---|---|---|
| | bus. lb. | s. d. | s. d. |
| No manure ... ... ... ... | 72 26 | ... | ...... |
| 2 cwt. superphosphate ... ... | 75 0 | 10 3 | (gain) 6 3 |
| 2 cwt. superphosphate, ½ cwt. nitrate of soda... ... ... | 73 9 | 23 3 | (loss) 18 4 |
| 2 cwt. B. and B. ... ... ... | 69 33 | 16 6 | 2 2 |
| 2 cwt. P7 ... .. ... ... | 70 34 | 16 3 | (loss) 3 3 |
| 2 cwt. P8 ... ... ... .. | *44 0 | 16 6 | ...... |

*Were mostly destroyed by cows.

The fertiliser mixtures are made up as follows :—P7 = superphosphate 1 part and bonedust 1 part ; P8 = superphosphate 1 part and blood and bone 1 part ; B. and B. = blood and bone. In calculating the returns the following values were placed on the manures :—Superphosphate, 5s. 1½d. per cwt. ; P7, 8s. 1½d. ; P8, 8s. 3d. ; B. and B., 10s. ; nitrate of soda, 26s. Maize was valued at 6s. 6d. per bushel.

## Northern Districts.

R. W. McDIARMID, Inspector of Agriculture.

THE experiments with maize conducted during last season in the north-western and New England districts were located as follows :—

R. A. Warden, Mt. Russell, near Inverell.
J. T. Maunder, Pallamallawa, near Moree.
W. H. Lye, Loomberah, near Tamworth.
Jas. Piper, junior, Llangothlin.
J. F. Chick, Tenterfield.

The experiments consisted of variety trials only.

### The Season.

The season was one of the driest on record at each centre excepting Tenterfield, and yields were consequently not heavy anywhere. The season was too dry at Pallamallawa for all varieties excepting two extremely early ones recently introduced from America, while all varieties failed at Tamworth from seed malting in the ground and giving a very low germination. At Inverell the season was disastrous to maize throughout the district, and scarcely any grain was harvested anywhere. Large areas of seed malted in the ground and produced nothing, while most of the sowings that germinated gave no grain and very little feed. The plots at Tenterfield and Llangothlin suffered during the dry month of January, but not to the same extent as the plots of other districts.

### The Plots.

*Inverell.*—These were sown during the third week of November, in a paddock composed of red soil (chiefly) with a little black. The seed was sown in dry land, but a thunderstorm of 1½ inches a week later gave a good germination on the red soil, but a poor one on the black. The sowing was done with a maize dropper, single grains being dropped every 18 inches in drills 4 feet 6 inches apart. The crop was intertilled three times, and hand-weeded. The rainfall during growing period amounted to 6 inches at the post office, about 1 mile distant. All varieties matured some grain. The plots were unmanured. The results were as follows :—

| Variety. | Yield per acre. | | Variety. | Yield per acre. | |
|---|---|---|---|---|---|
| | bus. | lb. | | bus. | lb. |
| Early Yellow Dent ... | 10 | 13 | Leaming ... | 6 | 51 |
| Funk's Yellow Dent ... | 9 | 16 | Gold Standard Leaming ... | 4 | 36 |
| ,, ,, ,, (local seed) ... | 15 | 6 | Sibley ... | 7 | 21 |
| Brewer's Yellow Dent ... | 9 | 29 | Leggett's Pride ... | 9 | 9 |
| Golden Glow... ... | 8 | 5 | Cornplanter ... | 5 | 40 |
| Golden Beauty ... | 6 | 44 | Hickory King ... | 6 | 0 |
| Golden Nugget ... | 9 | 3 | Silvermine ... | 12 | 21 |
| Goldmine ... | 5 | 47 | Bathurst Crossbred... | 4 | 9 |
| Stud Leaming ... | 4 | 9 | | | |

*Pallamallawa.*—The sowing here was done on 24th September in red loamy soil which had produced a good crop of maize in 1917. The land was ploughed in the autumn, and again in August, when it was also harrowed. Sufficient moisture was conserved to give a good and even germination, but there was not enough rain during the growing period to save the crop. The plots were unmanured. Only two varieties were harvested, North-western Dent and United States No. 133, each yielding a bushel per acre. The remaining varieties were fed to stock.

*Tamworth.*—Two sowings were made in the Loomberah district—on black and on red soil. The moisture in the land at sowing time gave a very low germination, and the bulk of the grain malted. The plots were unmanured. No grain was harvested here.

*Llangothlin.*—The plots here were used for a comparative test between Early Yellow Dent and Canada Early Flint; the sowing was made on 6th November (without manure) in rich potato land. The previous crop was potatoes. The land was ploughed in the early autumn and left exposed to the weather during the winter months. It was harrowed down and re-ploughed prior to sowing by hand. The germination and growth were in each case good. Rainfall figures are not available, but it was insufficient for the potato crops. Both varieties were harvested for grain.

The test resulted as follows:—Early Yellow Dent, 27 bushels per acre; Canada Early Flint, 18 bushels.

*Tenterfield.*—These plots were on the usual granitic soil, which was ploughed in August, and harrowed, cultivated, and harrowed again in November, just prior to sowing. The seed was sown on 12th November, and single grains dropped 18 inches apart in drills 4 feet 6 inches apart, with 1 cwt. superphosphate per acre. The germination and early growth were good. Cultivation between the rows was well attended to, and weeds kept down. The rainfall was deficient in January, but otherwise fairly good. The registration from sowing until the end of March amounted to 18·83 inches. Results:—

| Varieties. | Yield per acre. | |
|---|---|---|
| | bus. | lb. |
| Early Yellow Dent .. ... ... | 15 | 23 |
| Brewer's Yellow Dent ... ... | 21 | 13 |
| Golden Glow ... ... ... | 17 | 0 |
| King of the Earlies .. ... ... | **23** | **0** |

## Remarks.

The earliest maturing varieties were North-western Dent and United States No. 133. These varieties are only small-growing types, with small cobs, near the ground, and small grains; they should prove useful in districts regarded as too dry for the ordinary types. More extensive sowings will be made this year at Pallamallawa.

Canada Early Flint proved earlier than Early Yellow Dent grown under the same conditions, but was not equal to it in yield, and is not likely to be grown where Early Yellow Dent will mature. It suckers abundantly, with small cobs and small hard grains. Of the new varieties, Golden Glow matured ahead of Early Yellow Dent, and Brewer's Yellow Dent a few days later; both appear to be very promising varieties. At Tenterfield they both outyielded Early Yellow Dent, and showed better types of cobs and grain King of the Earlies is not so early as Early Yellow Dent; it has a small cob with very deep grains on a very small core.

Funk's Yellow Dent was sown in two plots at Inverell, and the local, or acclimatised, seed gave a marked increase in yield per acre. Leggett's Pride and Silvermine gave very satisfactory yields at Inverell, and promise good results in years of little rainfall.

Although the yields are very small at Inverell, compared with those harvested in the district under average conditions, they show what can be done with a small rainfall, suitable varieties, good cultural methods, and acclimatised seed.

The Llangothlin district usually is considered to have too short a growing season for maize, but the results from the plots show fair returns, and even better yields might be expected with a better season, acclimatised seed, and the use of such varieties as Golden Glow and Brewer's Yellow Dent. If these can be grown profitably, the district will benefit by being able to adopt a suitable rotation crop, and so indirectly to improve the potato yields.

At Tenterfield the new varieties outclassed the older variety, Early Yellow Dent, but this may be due principally to climatic conditions, for the dry spell in January seemed to affect this variety particularly, owing to the sensitive stage of growth it had then arrived at.

## Appetite as a Guide in Feeding Dairy Calves.

Experiments have been conducted by the Agricultural Experiment Station, Iowa State College of Agriculture, U.S.A., to determine, among other things, the effect of permitting growing calves to select their own feed, and the relative palatability of ground and unground grain to calves. Three calves (two heifers and a bull), in growthy condition, were subjected to experiment for two periods of thirty days each. They were given as much whole milk as was thought to be suited to their needs, but skim milk was used to replace part of the whole milk as they became older; shelled maize, cracked maize, whole oats, ground oats and other feeds were placed in separate compartments of a feeding trough; a supply of lucerne hay of medium quality was kept before them, and fresh water was kept in front of them for a few hours each day.

As the experiment progressed, the reduction in the allowance of whole milk tended to narrow the nutritive ratio of the ration, and the calves compensated for this by increasing their consumption of grains from 60·4 lb. in the first period to 178·1 lb. in the second, and their consumption of high protein concentrates (gluten, wheat and oil meal) from 91·3 lb. to 94·8 lb.

Research Bulletin No. 51, reporting the results, remarks that the calves preferred a much narrower ration than is usually thought sufficient. "In this choice of a narrower nutritive ratio the calves were possibly correct. The calves grew rapidly and gained in weight, but did not become too fat."

A few points of interest may be mentioned :—

Young calves prefer whole maize and oats to ground grains.

Oil meal appears to be more palatable than wheat bran, while maize gluten feed is not in favour with calves.

Calves have the ability to vary their consumption of concentrates to comply with their needs. For example, when whole milk is replaced by skim milk, the calves increase their consumption of grains.

The calves used in these experiments consumed a ration of much narrower nutritive ratio than is generally recommended.

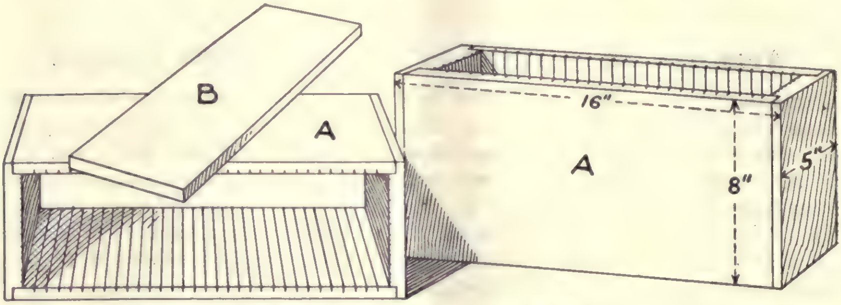
Salt and charcoal were evidently desired by these calves.

Water is important, even for calves to which milk is fed.

## "Brick" Cheese-making for the Household.

Requests for instructions in local cheesemaking for household purposes are frequently addressed to the Department. The officers of the Dairy Branch answered a recent correspondent in the following terms:—

Take perfectly sweet milk night and morning, heat to 80 deg. F. and add rennet at the rate of 4 ounces per 100 gallons of milk; a small quantity of colour should also be added, about 1 drachm to every 16 gallons of milk. Cut the curd when firm into cubes about the size of a pea and then heat it—if a small quantity, by placing a bucket of hot water in the curd, stirring it gradually until the temperature reaches about 112 deg. and taking about forty-five minutes to do so. Allow the curd to settle until it becomes firm with a rubbery feel; then draw off the whey, and (when this is completed) stir the curd well with the hands to draw out the superfluous whey. A small quantity of salt should be mixed through the mass, say at the rate of 1 ounce to 7 lb. of curd. The curd is then placed in moulds lined with cloth.




**The Mould used for making "Brick" Cheese.**

These moulds are generally made of wood, such as kauri or red pine; they should be about 10 inches long, 5 inches wide, and 8 inches deep. Shallow furrows should be scored with a saw on the inside of the moulds at intervals of about 3 inches to allow the whey to escape more readily. When the curd is placed in the mould a wooden folder slides easily into the mould and a brick is placed on the folder. The cheese should be on a wooden table. After about half an hour the mould should be turned, and the weight and folder placed on the reverse side; turning should be done twice, at an interval of about an hour. In twenty-four hours the cheese is taken out of the mould and salted; this consists of rubbing a small quantity of salt on the outside. Salting should be done for about three days, the cheese being turned each day. The cheese is kept in a cool place and turned daily until sufficiently ripe, which should be in about six weeks' time.

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"Much valuable information is published in the *Gazette*, and it is of great value to the farmers."—A Moombooldool Reader.

# Trials of Wimmera Rye-grass

(*Lolium subulatum*).

E. BREAKWELL, B.A., B.Sc., Agrostologist.

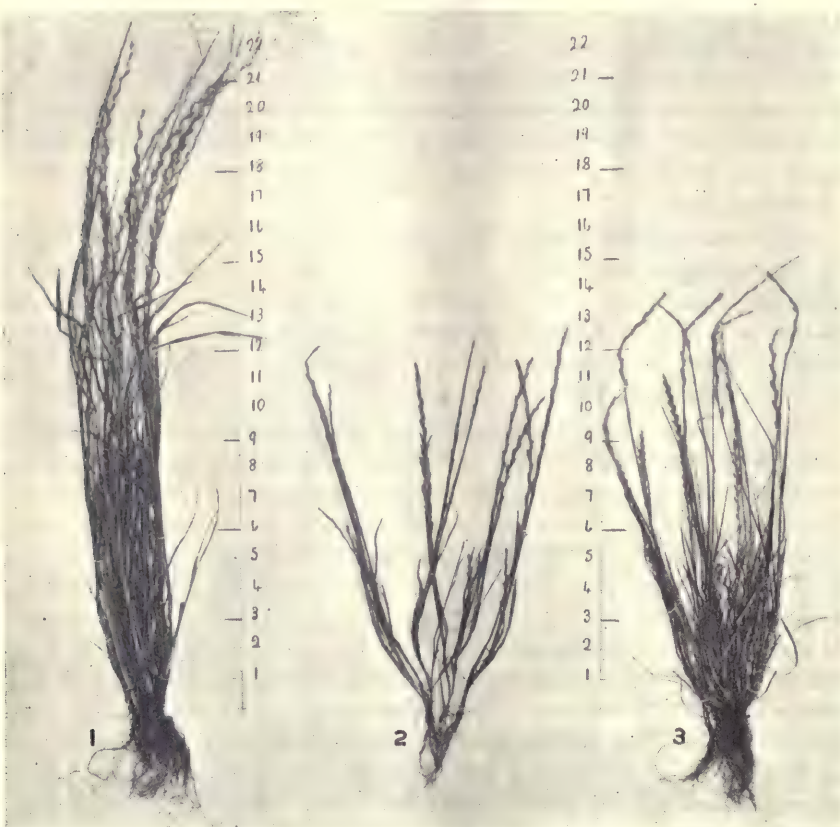
In the Victorian *Journal of Agriculture* for May, 1919, was published a long article by Mr. H. A. Mullett, B.Ag.Sc., on Wimmera rye-grass. It was there pointed out that this grass was producing remarkable results in Victoria, and was one of the most promising winter fodder grasses for wheat-growing centres. The article created a great deal of interest in this State, and it was decided to give the grass a trial under cultivation at some of the experiment farms.

Wimmera rye-grass was not previously unknown in New South Wales, for it was frequently found in different parts of the State, though never particularly abundant. It was described and figured in the *Agricultural Gazette* in April, 1918, under the name of *Lolium rigidum* Gaud (variety), which is really synonymous with *Lolium subulatum* Vis, the name under which it is known in Victoria.

Growing in a wild condition (without cultivation) in native and other pastures of New South Wales, it presents no promising features, and up to the present the grass has never been recommended for fodder. On its Victorian reputation, however, it was thought that it might do better under cultivation, and experiments have been conducted during the past year at Glen Innes Experiment Farm and at Hawkesbury Agricultural College. In addition, the attention of the Department was directed by Mr. Alexander, of Melbourne, to a 50-acre paddock which he had sown at Finley, in New South Wales. Owing to the dry weather the sowing in this paddock was delayed until the latter part of the winter, which is rather late in the year for best results. The seed germinated well but made very poor growth, and an examination of the paddock late in spring revealed a very disappointing pasture. Most of the plants, which were very small in size, had been completely killed out by the drought and hot weather, while those that had survived were hardly noticeable, so small was their stature. A neighbouring paddock of Danthonia grass presented a remarkable contrast, providing a thick tussocky growth of fine feed, on which the sheep kept in excellent condition. There is no doubt that early autumn sowing would have suited the rye-grass better, and Mr. Alexander intends to act accordingly next year. The experiment was sufficiently conclusive, however, to demonstrate that the grass will not stand up to our dry, hot conditions as satisfactorily as our native grasses.

**Reports from the Farms.**

As regards the trial at Glen Innes Experiment Farm, the Experimentalist, Mr. L. F. Rowney, reports:—"A plot of this grass was sown on 10th July, 1919. The land was in excellent condition, having been given a six months' fallow after alsike clover. The germination was excellent. The early spring being dry and frost fairly prevalent, the plot made very slow growth at first. The progress from the middle of October to the second week in November was more satisfactory. When about 8 inches high the grass commenced to



**Rye grasses grown at Glen Innes Experiment Farm**

1. Loietto (Italian Rye-grass). 2. Wimmera Rye-grass. 3. Perennial Rye-grass.

run into ear, and by the 15th of November about 60 per cent. of the plot was in ear and was setting seed freely. The maximum growth was reached about 1st December, when the plot averaged approximately 10 inches in height. The rainfall up to this date was 453 points. Only a small amount of fodder was produced, the average number of stems per plant being about five, and the leaves small and few in number.

"Apart from the ease with which a good stand of this grass can be secured and its free seeding habits, there is little to recommend it at present for the New England district, where *Lolium perenne* and *Lolium italicum* make excellent early spring growth, and produce a greater abundance of fodder.

"A palatability test with the grass was carried out, other grasses included in the test being perennial rye-grass, tall oat-grass and *Phalaris bulbosa*. All grasses were at the one stage of maturity. The test was carried out on the 18th December, 1919, with two bulls and six calves. All the animals showed a decided preference for the tall oat-grass. *Phalaris bulbosa* was also readily eaten by the two bulls, who preferred perennial rye-grass to Wimmera rye-grass. The calves, after the tall oat-grass was removed, divided their attention between *Phalaris bulbosa* and perennial rye-grass. The Wimmera rye-grass was practically left untouched by all animals till the other grasses were finished, some, in fact, remaining over until the following morning."

**Wimmera Rye-grass from Minyip, Victoria.**

Mr. W. M. Dill Macky, Experimentalist, Hawkesbury Agricultural College, reports:—"About the beginning of June this year a small quantity of seed of Wimmera rye-grass was received by the Principal for trial. This seed was supplied by Mr. Barnes, from Minyip, Victoria, as a grass that has recently come into great prominence there, on account of its promising value as a pasture in the wheat belts of that State. Apparently it has been tried by a great number of farmers in and around the Wimmera and Mallee districts, and in other parts of Victoria with more or less varying degrees of approval, although perhaps the majority, from all accounts, favour it. One farmer describes it as the 'best grass ever introduced into the Wimmera,' whilst others again contend that to the *bona-fide* wheat-grower it is 'a curse.' Nearly all agree as to its high feeding value. However, from our point of view in this State, very little is known about it, or at least very little notice has been taken of it.

"The sowing was made on 24th June in a soil of a white sandy loam nature. Five light drills, each 3 chains long, were run out 3 feet apart, and the seed sown by hand along them. A light application of superphosphate was made with the seed, which was then covered lightly with a rake. The soil at this time was very dry indeed, consequently germination was slow, and the season was so far advanced that the grass had a poor chance of displaying any good qualities to advantage. Although the germination was

good, rain was badly needed, and it arrived too late to be of any material advantage. The growth attained up to the time when the grass was cut for seed was only about 10 inches.

"On 31st July five rows of Italian rye-grass were sown in an adjacent plot for comparison. This is not yet mature, but it appears to stool much more profusely than the Wimmera variety, although at the time the Wimmera was cut the 'stand' was about the same for both. From the appearance of the two grasses throughout the small trial, it seems that the Italian would prove superior from every standpoint under favourable conditions in this district, provided it was sown at the proper time. This cannot be corroborated, however, until further trials have been conducted. The rainfall during the growing period was 10·09 inches.

"A palatability test was carried out with the grass at a very advanced stage. A portion of it was spread about one of the dairy paddocks amongst the cows which were about to be milked, but which had not been fed. All positively refused to touch the grass, but it was very dry and harsh, and consequently the experiment was inconclusive.

"Sufficient seed should be available for continuing the trial of this grass next season, when it is hoped that data of a more definite and reliable nature may be gained."

## Conclusion.

It must be admitted that the results during the past year in this State have therefore been very disappointing, and strikingly out of proportion to the results obtained in Victoria. The comparative growths of the different rye-grasses, and also of Wimmera rye-grass, grown at Minyip, Victoria, as shown in the accompanying illustration, indicate how far short the grass falls in this State as compared with perennial and Italian rye-grasses, and also how inferior it is to the Wimmera rye-grass as grown in Victoria. The very sparse and short leaf and the large amount of the plant taken up by seed head have been very characteristic features with us, and have greatly militated against its success.

At the same time, it should be pointed out that all the trials suffered from two serious disadvantages: (1) The seed was Victorian grown, and therefore not acclimatised to this State; and (2) it was not possible to sow at the right time (autumn). It is therefore too soon to turn the grass down for New South Wales, and it is quite possible that under improved conditions more favourable reports as to the present year's trials will be forthcoming.

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ONE of the greatest responsibilities that falls on either the Federal or Provincial Departments of Agriculture [in Canada] is the conservation of the great wealth that lies in the virgin soil. Innumerable considerations are involved in this one problem, but the whole affair can be accomplished if we engage in mixed farming with live stock as a basis. This is the fundamental principle underlying success in agriculture.—The Hon. S. F. TOLMIE, Minister of Agriculture, Canada.

# Soil Improvement for Maize.

## I.—Manures and Fertilisers.

[Continued from page 35.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

### Increased Yields from Stable or Animal Manure.

Experiments with stall manure have been conducted in Ohio* for the past twenty years and leave no room for doubt as to the definite value of its effect on maize and the following crops in a rotation. It has been found that an application of 8 tons of stall manure per acre on maize once every three years (in a rotation with wheat and clover) has *increased the yield of maize 23·2 bushels per acre as an average for the last twenty years.* Correspondingly increased yields have also been obtained from the other crops in the rotation—all due to the manuring for maize. In Indiana,† on a plot of continuous maize for twenty-seven years, an average increase of 12 bushels per acre has been obtained from an annual application of 3½ tons of manure per acre.

From the figures showing the composition of animal manures, it will be seen that of their three fertilising elements phosphorus shows the smallest percentage. The deficiency, together with the fact that most of the soils of this State are also deficient in this plant food ingredient and readily respond to applications of phosphate in some form, has led to the reinforcement of animal manure with superphosphate. In the first mentioned rotation (Ohio), a reinforcement of animal manure at the rate of 40 lb. superphosphate to 1 ton of manure (*i.e.*, 320 lb. superphosphate applied with 8 tons of manure once every three years) *increased the yield of maize 35 bushels per acre as an average for twenty years*, as well as increasing the yield of the following crops in the rotation nearly double that of the increase obtained from manure without superphosphate.

Enough has been said of the value of animal manure for maize to indicate the importance of its conservation. Whatever the means adopted to that end and for its application as described, the extra labour involved will be, in most cases, amply repaid.

The question is sometimes raised whether it is better in using a limited amount of animal manure to spread it over a large area or only to enrich a small area with it. The results obtained in Ohio over twenty years indicate that greater returns are obtained by spreading the manure evenly over a large area, though under our conditions, for poorer soils, or to ensure the production of seed where there is likelihood of complete failure in some years, a heavy application on a small area would probably be best. The increased prices of farm products and feeding stuff of

* Ohio Agr. Expt. Sta. Mon. Bull., Vol. 3, No. 5 (May, 1918).
† Purdue Univ. (Indiana) Bull. 222 (1918).

late years have given animal manure a greater value. It is probably worth £1 to £2 per ton at the present time. Only, of course, from tests as to the increased yields attending its use can any definite value be assigned to it.

### Live Stock *versus* Grain Farming.

From the results just quoted it will be seen that live stock plays an important part in maintaining and increasing the fertility of the farm. For many years maize-growing for grain was conducted as a sole business on certain farms on the coastal river flats that were once renowned for their fertility. Many of these farms are to-day going over to dairying—a sign that they are "worked out." With dairying is also combined pig-raising on a larger or smaller scale as a profitable adjunct, and the beneficial effect of the change of system and of the innovations incidental to it soon becomes apparent. It is generally recognised that leguminous hay and fodder crops (chiefly lucerne and clover) are most profitable for stock, and that, with the grass pasture which must also be provided, they form the best means of increasing soil fertility. The effect of this is apparent when the land again comes under cultivated crops, the stimulation given to the maize crop following pasture or leguminous hay crops being largely due to the accumulation of organic matter and increase of fertility elements in the surface soil. There is, too, no question that maize fodder and grain are amongst the best feeds, and almost indispensable for dairying and pig-raising.

With these increased yields of fodder and grain in the maize crop, probably only half or three-fourths of the area is necessary to produce the amount obtainable by continuous maize culture. In those districts, such as Inverell and the Northern Tableland, where wheat or oats for grain or hay is grown as well as maize, live-stock farming means that a greater number of cattle and sheep are kept, more pasture, lucerne or clover, is grown, and more maize for fodder and silage and less for grain should be sown than where grain farming is followed without many cattle, pigs or sheep. The rich soils of the Inverell district may be able to stand grain farming better, perhaps, than many other soils in the State; but although its effects may not be felt there for some years yet, such methods can only result in a poor inheritance for the next generation. Apart from this, moisture is usually the limiting factor in the Inverell district, and this can be conserved in greater amount in the soil by the decay of deep-rooting crops like lucerne and clovers, while an abundance of hay for the drought periods is assured. We have, then, the apparent anomaly, that in order to be more prepared for droughts it is better to increase the stock and to go in for less grain farming and more for mixed or live-stock farming, for which more lucerne and clover will have to be grown. The agricultural possibilities of a district like Inverell, it might be added, will never be fully realised until the country is studded with silos to conserve, in a succulent form, the riotous growth of fodder which is wasted in good seasons.

As a matter of actual fact, the decision whether grain farming or live-stock farming is to be followed is largely determined by the land tenure. A tenant farmer on short lease is fully justified in "skinning the land for all it is

worth" by grain farming; on a long lease, however, and on his own land, the time will soon arrive when the farmer must seriously consider the question on its other merits. Even now the careful buyer or renter of land might profitably make inquiry into the system of farming previously followed, as a factor worth consideration in arranging suitable terms.

### An Interesting Experiment.

The results of an interesting experiment, in which a system of live-stock farming was compared with grain farming,* with an identical rotation of corn, soy beans, wheat, and clover, are available from Ohio. As an eight-year average the yield of maize in the live-stock system of farming was 64·58 bushels per acre, and in the grain system 58·57 bushels. Even in this rotation, which provided two leguminous crops in four years, and in which the crop residues were returned to the soil as stubble or as green manure, in the grain-farming system the yields fell behind the live-stock system. How much more seriously would the yields be reduced in grain farming when—as is the usual practice in grain farming in this State—little or no attempt was made to grow legumes or to return crop residues or green manure to the soil?

A word of caution is perhaps essential to those who might think that live-stock farming is all that is necessary to maintain or restore fertility to worn-out land. How, for instance, can the elements of fertility be increased in the soil by pasturing when only about three-fourths of these elements in the feed consumed pass through the animal and one-fourth is retained for the building up of its body and in the composition of its products—milk, wool, &c.? To a certain extent, the surface soil can be maintained in fertility elements by the pasturing of perennial deep-rooting legumes, but it is difficult to see how it can be enriched greatly by pasturing unless purchased feeds are used in addition, or unless cultivation crops (especially lucerne and clovers) are "soiled" or fed as hay on the pasture. Apart from this consideration, it has been proved in older countries, by definite experiments, that although nitrogen and organic matter can be maintained or increased by live stock farming and the growing of leguminous crops, no such maintenance or increase of phosphates can be made except by the purchase of phosphatic fertilisers.

### Fertilisers.

Our knowledge of the principles underlying the relationship of plant food materials in the soil and commercial fertilisers is by no means complete. We do know, however, something of the value of these fertilisers under certain conditions for maize, and are able, as the result of definite field tests, to make some recommendations.

An analysis of the soil gives us information concerning the total amounts of nitrogen, phosphorus and potash (the three chief plant food ingredients required by crops) in the soil analysed, but does not tell us how much of these materials are readily available to plants or what amount can be made readily available. A fertiliser practice based on the supply of elements in which the soil is found to be deficient by chemical analysis has been proved

* Ohio Agr. Expt. Sta. Bull. 328 (1918).

by field tests to be absolutely wrong. The crop must have in an easily soluble form all the plant food it needs; otherwise the size of the crop is limited by the amount of plant food which is easily available. Some regard must therefore be paid to the plant food removed by the crop from the soil. This is now considered to be of more importance than the total amount of plant food (much of which is insoluble to the plant) present in the soil. In other words, chemical analysis of the soil is no guide to fertiliser requirements, but in a study of the plant food removed by different crops from the soil and actual field tests with different fertilisers, there is bright hope for the correct and profitable use of fertilisers to ensure the permanent fertility of the soil.

The two following tables show (1) the amount of plant food removed by an average maize crop and (2) the amount supplied by artificial fertilisers :—

TABLE showing Plant Food removed from one acre by an average Maize crop.

| Crop. | Nitrogen. | Phosphoric Acid. | Potash. |
|---|---|---|---|
| | lb. | lb. | lb. |
| Maize (grain), 50 bushels.. | 50·0 | 24 | 16 |
| Do (stalks), 3,000 lb. ... | 25 | 7½ | 36 |
| Total .. ... | 75·0 | 31½ | 52 |

If the stalks are returned to the soil, whether by feeding off or by ploughing under, it may be reckoned that only 50 lb. nitrogen is removed instead of 75 lb., and that the bulk of the phosphoric acid and potash in the stalks is also returned to the soil thereby. When the stalks are burnt, however, the whole 75 lb. of nitrogen is removed from the soil, and some of the potash (now largely in a water-soluble form in the ash) will also be lost from a sandy soil by leaching. The loss could be minimised by growing a cover crop during the winter, provided the rainfall is high during this period. It may be reckoned that ten shillings worth of fertility is destroyed from an acre by burning the stalks from a 50-bushel maize crop.

TABLE showing Plant Food supplied per acre by different Artificial Fertilisers commonly applied (alone or in mixtures) to Maize in New South Wales.

| Fertiliser. | Nitrogen. | Phosphoric Acid. | Potash. |
|---|---|---|---|
| | lb. | lb. | lb. |
| Sulphate of ammonia (56 lb.) ... ... | 11·2 | ... | ... |
| Nitrate of soda (70 lb.) ... | 10·5 | ... | ... |
| Dried blood (1 cwt.) ... | 14·5 | ... | ... |
| Blood and bone (2 cwt.) ... | 11·2 | 33·6 | ... |
| Bonedust (2 cwt.) ... ... | 9·0 | 49·3 | ... |
| Superphosphate (2 cwt.) ... | ...... | 38·4 (water soluble) ... | .. |
| P7 (2 cwt.)... ... ... | 4·5 | 43·8 (19·2 water soluble) | ... |
| P8 (2 cwt.)... ... ... | 5·6 | 36·0 (19·2 water soluble) | ... |
| Sulphate of potash (28 lb.) | ...... | ........... | 14·4 |
| P5 (1½ cwt.) ... ... | ...... | 19·2 (water soluble) ... | 14·4 |

P7 mixture consists of equal parts of superphosphate and bonedust; P8 of equal parts of superphosphate and blood and bone; and P5 of 4 parts superphosphate to one part sulphate of potash.

Where 80 or 100-bushel maize crops are raised, as in some instances on the alluvial soils on the coast, the depletion of the fertility elements obviously goes on much faster, and the amount of plant food removed by such heavy crops is by no means wholly replaced, even by the usual application of fertilisers. It is, of course, largely the ready availability of the plant food in such fertilisers which is responsible for the increased yields that result from their use. There is no doubt that on some rich alluvial soils which are given good cultivation, sufficient plant food material can be made readily available without the addition of fertilisers for some years yet; but it is a matter of experience that it is much better economy, besides being much easier, to maintain or increase the productivity of a fertile soil than to restore fertility to an exhausted one. These facts, with the additional weight given by the results of actual tests with fertilisers, no longer allow of the contention that artificial fertilisers are not necessary for maize growing on most of our soils.

Every practical farmer knows that moisture in the soil is essential for fertilisers to have effect on the crop—from first considerations and from the actual experience of the very beneficial results obtained from most fertilisers in wet seasons. This knowledge can be applied by having the soil well provided with humus or decaying organic matter to hold the moisture. In the decay of organic matter also carbonic acid is formed which renders much plant food available from insoluble substances. It is a ruinous policy to apply fertilisers alone to a soil which is lacking in humus and which dries out quickly.

All the experience with maize growing points to the fact that it is almost impossible to make the land too rich for the crop. Record yields of over 200 bushels per acre have been made in America by the addition of 40 to 60 tons per acre of stable manure and 30 cwt. or so of chemical fertilisers. Impracticable as this is, it is certain that it is waste of time, energy, land and money to attempt to grow maize on poor land. A considerable growth of stalk must take place for heavy grain yields, and it is only good land which will enable this stalk development to take place. If it is desired to grow maize on land which is not rich enough to permit a good growth of stalk, it is best to build up the fertility of the soil with other crops before attempting maize. How this can be done will be shown later.

There is a common opinion that rotation of crops will maintain the fertility of the soil and render the purchase of commercial fertilisers unnecessary. There may be some truth in this for a few years at least on some of our new soils, though it depends on the crops grown and the use to which they are put; but on old fields under the best rotation at Rothamsted and in America it has been proved that the yields are reduced by half after many years if fertilisers are not employed.

Of the chief elements of fertility, phosphorus functions in the production of seed while nitrogen and potash (particularly the latter) go more largely in the production of stalk and leaf. From the figures given it will be seen that three-fourths of the total phosphoric acid removed by the maize plant is

contained in the grain. Thus, when maize is sold off the farm this much fertility is lost; while under live stock farming, where the grain is fed to pigs and cattle, only one-fourth of the amount of fertility in the feed is retained by the animal and eventually sold off the farm. This largely explains the exhaustive effect on the soil of grain farming as compared with live stock farming. Even in live stock farming, one factor sometimes left out of account is the appreciable amount of fertility removed by the sale of milk off the farm to the cheese factory as compared with the negligible amount removed by the sale of cream to the butter factory. It has been calculated* that for every ton of grain sold at the elevator the farm loses 20s. to 25s. in fertility; for every ton sold at the stockyards there is a loss to the farm of 4s. or 5s. in fertility; while for every ton sold at the factory as butter-fat, the farm loses only 10d. in fertility.

(*To be continued.*)

## Substitutes for Pollen and Nectar.

The following three-fold inquiry recently reached the Department from a Lake Macquarie apiarist: "Is there any substitute for pollen which can be given successfully to bees; if so, where can it be obtained? What is the best syrup for feeding bees; can ordinary golden syrup or treacle be used—if so, how? Can plants or trees be planted to help in pollen or honey production along the coast?"

"If given rye flour as a substitute for natural pollen, bees will raise brood and therefore assist the colony over a period of pollen drought," replied the Senior Apiary Inspector. "Although no substitute can be considered equal to natural pollen, rye flour is considered the best known at the present time. In feeding the flour to the bees in the first instance it should be placed in several trays about the apiary. The trays should be protected from the rain, but free access to the bees must be allowed. Feed in small quantities daily, just sufficient for about the day's requirements, as it is not good to have a surplus stored in the combs.

"The best syrup for feeding bees is made from cane sugar and water, equal quantities (by volume) of each. The water is first brought to boiling point and the sugar then slowly added; when it is dissolved the syrup is fed warm to the bees. For winter stores, two parts of sugar to one of water would be required. Always feed inside the hive, where, if care is taken not to spill the syrup, it can be fed in the daytime; otherwise, it would be best to feed late in the afternoon. I would not recommend the use of golden syrup or treacle as a food for bees, as they have a tendency to cause dysentery.

"Trees can be planted to assist in increasing the production of honey and pollen on the coast, but a fairly large number would be required to make much improvement. Ironbark, grey gum (eucalyptus) and the dwarf apple (angophora) are to be commended for honey; for pollen plants, maize, pumpkin vines and black thistle are good."

* Kansas State Board Agric. Quart. Rept., March, 1916.

# Chats about the Prickly Pear.

## No. 1.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,

Government Botanist and Director, Botanic Gardens, Sydney.

I KNOW of no subject included under Australian economic botany requiring more candid treatment than that of prickly pear. In the course of time, with increased experience, we can agree to insist less emphatically on certain of our prejudices, and I may frankly admit that I am now less dogmatic in regard to quite a number of points concerning pear than ten or fifteen years ago. At one time I discounted every method of utilisation, believing that they hindered destructive methods, which I regarded as alone worthy of consideration.

My study of the pest now extends over nearly a quarter of a century, and during that time I have patiently interviewed the local expert who had only seen prickly pear on the South Head road, but who was confident he understood the magnitude of the problem; those who were equally confident of obliterating the pest by chemical or engineering means when a little conversation showed that they were ignorant of the most elementary principles of either science; the countryman who knew pear country and had made no headway against it, but who was quite certain that the "townie" had nothing to teach him; and hundreds of worthy citizens—some with mutual profit.

The prickly pear question is not appreciated by most people because its inroads are removed from the great centres of population; because it does not particularly inconvenience them, they ignore it—a very human habit in regard to quite a number of awkward problems. I am confident, nevertheless, that it will be a bad day for this country whenever we take a fatalistic attitude in regard to prickly pear. It has been said that the British are always at their best when they are fighting against odds, and we must fight the pear with every weapon to our hand or hereafter to be invented. It seems to me that there is some danger of our relaxing our efforts in regard to pear, because some of us are waiting for the biological phenomenon—a coccus or scale which will do for the pest pear what a certain coccus did for the less formidable *Opuntia monocantha* in India a century and a quarter ago. Let the biologists get to work, by all means, and more power to them, but let us get busy in regard to methods available to everyone at the present moment.

In many areas in Queensland and New South Wales the pear has got such an overwhelming hold that we do not, at the present time, see any way out of the difficulty as far as they are concerned. The great bulk of pear country,

however, is not so bad, being affected lightly and more densely. I shall subsequently bring under the reader's notice various suggestions for the utilisation of pear; at the present time I see nothing that offers the same prospect of success, or partial success, as that of utilising it as food for stock. Is there, I ask myself, any reason why the wholesale feeding of pear to stock in the United States, with the aid of machinery, cannot be a commercial proposition in Australia ? This is a question which farmers and pastoralists must ask themselves, and it is reasonable to ask them to do so. I think it is a fact that during the recent drought, suffered by the greater part of New South Wales and Queensland, not a hoof would have been left in some areas had it not been for prickly pear, bad as it is. But we utilise it sulkily, and do not enter into consideration of the feeding process with any enthusiasm, or under any system. We thus suffer in two ways—we handle the pear expensively, and because of this, we do not clear the land as rapidly as we should. The improvement at present in my mind's eye, in our method of attack, is outlined in the following pages.

In the first place, every holding, freehold or leasehold, small or large, containing pear should, in my opinion, be compelled by law to possess apparatus for the treatment of pear as food for stock. Such apparatus would include a suitable pear-fork (as in use in the United States), a spine-torch apparatus, or apparatus for steaming, and a sort of chaffcutter apparatus for cutting the pear into strips. I will later bring under the reader's notice apparatus actually used by American farmers—who are usually considered pretty wide-awake. These pieces of apparatus are already extensively used in the United States, and a competition conducted by our Government would go far to stimulate the discovery of the best machines, and to place them on the local market at the lowest rates.

I believe that many landowners would do more than they do in regard to pear eradication, provided that they knew the right apparatus to get, and if they felt that everyone was " doing his bit " in the same direction. There is an old French proverb to the effect that it is the first step that is the trouble; and I am satisfied that if every landowner had the best type of apparatus or machinery available, he would appreciate the desirability of using it. With a tool-chest in the house, repairs are done with facility and even with pleasure. On the other hand, the householder who is not thus provided, and uses extemporised appliances, often lets his house or furniture fall to pieces, or, if he starts mending, often still further damages his property. With ten thousand landowners ready to work, I am confident that work would be done in stock-feeding and pear-clearing that would make a very big aggregate. At the present time many owners are doing simply nothing. While blaming nobody, I would earnestly ask such owners to think over and practically consider the aspects of the subject which I have indicated. At the present time we have 10,000 foci of pear-infection. Will farmers and pastoralists say why we should not have 10,000 foci of pear utilisation and

destruction ? I have spoken to intelligent New South Wales stock-owners who have told me that they could not have carried on without pear on their holdings, particularly during the recent drought.

It will take some time to supply landowners with the necessary apparatus and machinery, so the actual work cannot begin at once, but I believe that the present time is suitable for action such as I have indicated.

The subject of Australia's most important weeds (for such are the Opuntias or prickly pears) is one which I have studied with some care. On coming to the Botanic Gardens in 1896, after a long training in economic botany, I was struck by the imperfection of our knowledge of these plants, and in the same year, in this *Gazette* (pp. 651–7), I offered a "Plan of an enquiry into the merits of Prickly Pear as a Forage Plant" (translated from the French of Paul Bourde). In this *Gazette* for January, 1898 (p. 38), I submitted an abstract of a paper on Opuntia by P. Gennadius, Director of Agriculture at Cyprus. "A Preliminary Study of the Prickly Pears naturalised in New South Wales," in the *Gazette* for the same year (pp. 978–1008), with a number of illustrations, was a more ambitious effort, and was the first attempt in Australia to elucidate our prickly pears.

In 1900 I inspected most of the Opuntia collections in Europe, and had several interviews with the then leading authority on Opuntia in the world (Prof. Schumann, of Berlin), discussing with him Australian forms and Australian conditions; and in 1902 and subsequently, the Sydney daily newspapers gave me considerable space for articles on the prickly pear. Previous to 1906, and subsequently, by means of specimens, coloured drawings and lecturettes, I brought the matter of prickly pear before the Royal Society of New South Wales. In 1907–8 (Mr. A. H. Campbell being my executive officer) I conducted, on behalf of the Lands Department, experiments for several months on the pear pest on Scone common. These experiments were both qualitative and quantitative, and in them arsenical sprays of various strengths and composition were employed. Some of the results will be referred to later.

I made two trips to Queensland pear-infested country, one which included Warra and Dulacca, on which I was accompanied by Mr. Temple Clerk, and the other to the Rockhampton district in 1909. I am not a stranger to pear in some other parts of Queensland, and I have visited some really bad pear country, which it is the duty of every citizen to do. The series of papers in the *Gazette* entitled "The Prickly Pears of interest to Australians," No. 1 (April, 1911), to No. 15 (September, 1917), owe much of their value to the beautiful coloured plates by Miss Flockton. The series is not quite complete; but it would be difficult for an Australian now to say that he cannot recognise any prickly pear that has become acclimatised in Australia, or that he has not the chief particulars in regard to each of them before him. He can, therefore, follow non-Australian literature in regard to our introduced species. "The Cultivation of Spineless Prickly Pear" (*Gazette*, October,

1917) followed next, the article being the outcome of some experiments conducted by Mr. H. J. Kelly and myself at Nyngan, extending over some years, to ascertain to what extent "spineless" pears developed spines in dry areas. (The experiments should be continued in other localities, and in their connection I shall always be glad to be of help.)

Realising that there must be a standard collection of Opuntias in Australia, I formed such a one in the Botanic Gardens, Sydney, based on those I found under cultivation in 1896, to which I added (*a*) any others from Australian Botanic Gardens; (*b*) those naturalised in Australia; (*c*) critical forms (1) from Dr. Griffiths, of the U.S. Department of Agriculture; (2) from the late Sir Thomas Hanbury, of "La Mortola," Ventimiglia, Italy; (3) from various non-Australian Botanic Gardens; (4) from dealers in cacti. The Opuntia collection in the Sydney Botanic Gardens, in spite of the hasty removal of a portion of it because of the City Railway, is probably without a rival south of the equator. Mr. J. L. Boorman, collector, Botanic Gardens, has been the faithful custodian of this Opuntia collection. We have tested the hardiness of various species, have proved that plants received under very many names were strict duplicates, and so destroyed them, have made notes on their spiny qualities, and have tested their value as dessert fruits. This collection has supplied the material for hundreds of beautiful coloured drawings, by Miss Flockton of the Botanic Gardens, and these refer to numbered plants, have been strictly dated, have been compared with each other, and are records for all time. Occasionally I have been visited by a man from pear country, who has demanded instant destruction of the whole of the accursed plants, but I have assured him that I have never heard of a pear getting loose from the Botanic Gardens for over fifty years, and that they do not spread much in the Sydney district, the climate being unfavourable. I have also pointed out that prickly pears must be studied in the Sydney Botanic Gardens, where there is a botanical staff, a rich collection of other plants for comparison, and a valuable botanical library.

I believe it to be of public interest to hint what one Australian establishment has done in regard to prickly pear investigation. We at least have not ignored the subject.

(*To be continued.*)

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## A Nurse Crop with Lucerne.

Having tried sowing lucerne with a nurse crop and without, Mr. J. I. Renshaw, of Binnaway, is now convinced that the cover crop is not desirable in seasons such as that just experienced.

Only 20 lb. of wheat was sown with 10 lb. of lucerne by Mr. Renshaw, but where lucerne was sown by itself the stand is nice and strong, and apparently twice as thick as on the portion sown with wheat.—B. C. Meek, Assistant Inspector of Agriculture.

# The Pruning of the Vine.

[Continued from page 55.]

H. E. LAFFER, Viticultural Expert.

## Systems of Training Vines.

THE grape vine is, by natural inclination, a creeping or climbing plant adapted to trailing over some stouter plant or structure, in order to support its more or less slender stems. Under cultivation, by definite systems of pruning, the vine is established with a stout rigid framework, capable of supporting the weight of annual growth and fruit. The development of varieties has given rise to types of varying habit, some being more or less erect in their growth, while others retain the creeping characteristics of their wild progenitors. It is upon this habit of growth that the system of training is mainly dependent. Varieties inclining to the sturdy upright habit of growth are often trained upon the "bush" or "goblet" system, each vine standing individually with a stake to support its annual growth.

Those of trailing habit are generally trained upon a trellis, in which the permanent structure is built upon and supported by a tightly-strained wire. In most cases a second wire acts as a support to the annual growth, which clings to it by the aid of tendrils. For the greater part, the bush-trained type is spur pruned, while the varieties upon trellis are more adapted to rod pruning. In certain instances the rod and spur are applicable to both forms of training. Although no definite rule can be laid down for guidance, it will usually be found that the stout-caned varieties, with short internodes, adapt themselves to the spur pruned bush, while the trellised ones are longer in the internodes and more slender in their canes.

## The Bush or Goblet System.

The perfect type in this system consists of a short, stout stem, of about 10 to 12 inches in height, supporting two or more main arms, according to the strength of the vine. These main arms may each be subdivided into two or more secondary arms, upon which the fruit-bearing wood is carried. The number of the secondary arms is limited only by the vigour of the vine, and may vary from four to twelve. Above this number it becomes difficult to allow space for them all, and when conditions of soil are such as to induce this excess of vigour, it will be found more satisfactory to adopt a system of trellising.

## Formation of the Bush.

In the first place, it should be the aim of the grower to secure a strong, stout stem of a sufficient height to prevent the bunches of fruit from touching the ground when they are fully developed. For wine varieties it will generally be found that a stem with a clearance of 10 inches to the base of the main arms will be entirely satisfactory. Table varieties are sometimes

trained rather higher, and may go up to 12 to 14 inches. In practice, some experienced growers train their vines even higher. This is more particularly so in the county of Cumberland, N.S.W., largely owing to the length of the bunches of the varieties grown. In South Australia and Victoria the tendency is to reduce the height of the stem as much as possible. The closer the fruit-bearing wood is to the soil the greater will be the proportion of sugar in the fruit, and therefore it is a disadvantage to increase the height of the stem unnecessarily. Provided that the young vine is supported by stakes during the years of formation, a 10-inch stem becomes stout enough to withstand the effects of wind pressure. The higher the stem the less resistance, and therefore the greater need of stakes.

The young vines at the end of the first year's growth will be carrying canes of varying strength. It is not wise to seek to establish the stem from weak growth, and therefore, unless a vigorous cane can be secured, it is wiser to remove all but the one cane and to shorten that back to a spur of two buds. Subdivision at this stage not only overtaxes the strength of the young vine, but it establishes the main arms too close to the ground. A strong cane is required which can next year be cut back to the required height. This stage in formation is figured in the illustration, Fig. 11A, with the resulting growth in the following summer. In some cases it is the practice to allow but one cane to develop, all the others being disbudded. Such a practice requires very careful treatment of the selected cane, for, in case of accident, there is no other as an alternative. Apart from this, the unnecessary interference with the foliage of young vines is not to be recommended. Most young vines will carry two good canes quite satisfactorily.

The next step in the training is shown in Fig. 11B, the best available cane being cut back to rather more than the height of the proposed stem. The second bud from the top should be about the height, as the main arms will be developed from these two or three buds. It is well to leave a long internode above the topmost bud in order to tie to the stake. The growth from this stem will vary, but there should be no difficulty in securing, at any rate, two main branches at the next pruning. The pruner must exercise his judgment and establish the arms according to the strength of the vine. Each vine must be treated individually, pruning it in accordance with its growth, for the reason that it is rare to find absolute uniformity in any number of young vines.

Fig. 11C shows the stem with two main arms established, each consisting of a strong two-bud spur. In addition, one spur shows a well-developed base bud. The summer growth is illustrated as five good canes from which the secondary arms will be chosen. These canes will in all probability have carried fruit during the summer.

In Fig. 11D the vine is shown pruned with two spurs upon each main arm. The choice of these spurs should be from the canes best designed to give a symmetrical formation to the crown of the vine.

Although four spurs are figured it may be advisable in some cases to create only three, or it may even be necessary to reduce to two again if the

growth is weak. The illustrations only follow out the general idea of development, and must not be taken as a definite rule. Naturally, in figuring a subject diagrammatically the more or less ideal condition is accepted, though in practice all manner of variations and difficulties arise. It is here that judgment and skill on the part of the pruner are required to make the best of unsatisfactory conditions. The resulting growth from Fig. 11D is figured as eight good canes which will have fruited during the summer.

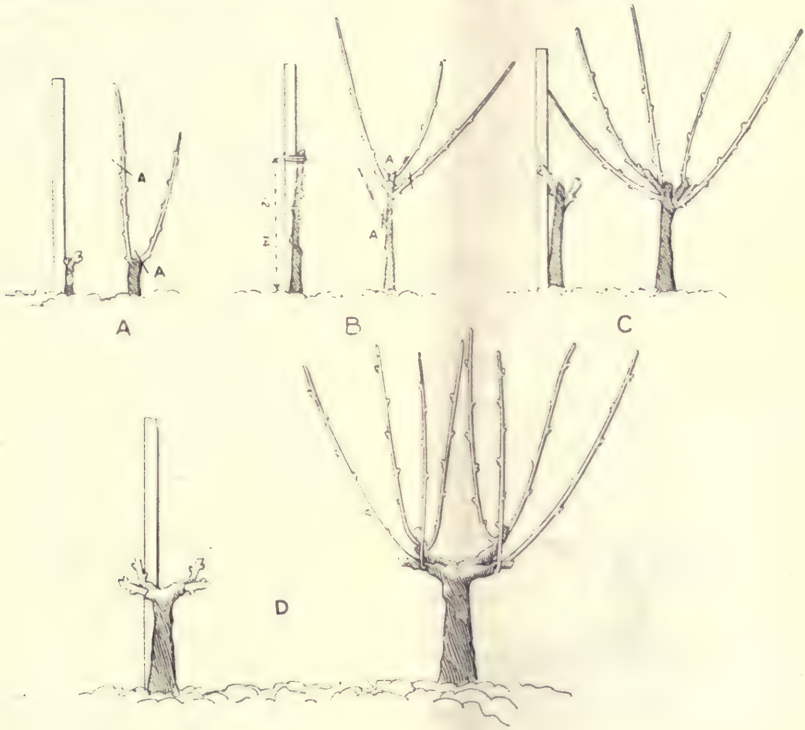


FIG 11.

**Diagrammatic representation showing the formation of the bush vine.**

From this stage the formation may rest with the annual renewal of one spur upon each arm, but more generally the number of secondary arms will be increased to five, six, seven, or eight at intervals of one or more years. This may be taken as a good average; but instances arise when a further increase is warranted as the vines become older and stronger.

The vine may now be considered as definitely formed according to plan, and its future treatment consists in annual renewal of fruiting wood with due regard to vigour and shape of the vine. In the case of vines that continue to show more than ordinary vigour, additional spurs may be created with a view to securing heavier crops. On the other hand, when there is evidence that the vines are being overloaded to such an extent that the

growth is becoming weak, the spurs will need to be reduced in number. The same result will possibly be achieved by reducing the spurs to one bud instead of two, as a temporary expedient.

In the course of years secondary arms tend to become overlong, and methods already described should be resorted to in order to reduce them to normal length. Under this system of training there is no cost of trellising, although there is, of course, the cost of stakes to be taken into account for the early years of the vine at any rate. Cultivation is more economical, for the reason that it is quite possible to cultivate in several directions when the vines are planted at suitable distances. Hand labour is thus reduced to a minimum.

The varieties which may be trained upon the spur pruned bush comprise the following:—Mataro, Grenache, Carignane, Frontignac, Pedro Ximenes, Black Hamburgh, Muscat Hamburgh, Doradillo, Muscat Gordo Blanco, and most of the table grapes.

### Rod Pruned Bush Vine.

On grounds of economy in the cost of establishing a vineyard, the rod system is sometimes applied to the bush-trained vines, instead of erecting a trellis. Although this may be considered false economy in many ways, the fact remains that a fair measure of success is obtained from the practice. It may be applied equally well to vigorous specimens of the varieties mentioned, when grown upon soils of more than average fertility. As a means of checking rampant vigour, the use of one or more rods for fruit-bearing secures to the grower a much heavier yield from these soils.

FIG. 12.
Spur pruned bush vine.

Any of the spur pruned varieties mentioned in the preceding paragraph will respond to this treatment. In addition to its application to this particular class of vine, others which are usually trellised, such as Shiraz, Carbenet, Riesling, Malbeck, &c., may be trained on similar lines. At the same time it must be borne in mind that these latter varieties yield the best returns when systematically trained upon a trellis. The rod pruned bush can only be looked upon as a possible substitute.

### Formation.

In all respects the vine is developed from year to year in exactly the same manner as described for the spur pruned type, and until the formation is completed it would be unwise to adopt any regular system of rods. The number of spurs will equal, and in most cases exceed, that of the rods, and, generally speaking, it will be found that from three to four rods to six spurs

will be sufficient. The rod must be looked upon as temporary, to be removed at the pruning subsequent to its having fruited. The spur will be given choice of position in so far as it will maintain the shape of the vine, and provide strong canes for the next season. For this reason it is not absolutely essential that the spur shall be fruit-bearing, although, for the sake of the grape crop, it is preferable that it should be so. It frequently happens that a good water shoot occupies a position superior to that of a fruit shoot. This is more frequent in the case of old vines than young ones, and wherever the opportunity arises, it is well to make use of these canes to improve the shape or renew the arms. Should the pruner think it preferable, a fruiting spur, even though it be in a bad position, may be left for the time being, but provision should be made for the next year by leaving one bud upon the water shoot, from which a cane can be secured later on.

Having selected the spurs, the requisite number of rods will be reserved from good fruit-bearing canes, while the remainder will be cut away. The general plan adopted to secure the rods in this system of pruning is to bend them over the top of the vine, intertwining them in the form of a dome. If preferred, the ends of the rods may be tied down to the extremities of the spurs, in which case a long internode should be left upon both spurs and rods, with the enlarged portion of the rods to prevent the tie from slipping. The plan of twisting the rods is the one more generally adopted, as it is quicker and just as effective. The objection may be raised that this system leads to overcrowding of the foliage; but so long as the strength of the vine is not overtaxed and the spurs are given good positions it does not matter. The system is in no way claimed to be as good as the trellis, but is merely an economical substitute. So long as the vines retain their vigour the system may be practised, but so soon as they show evidence of weakness the rods should be reduced in number or done away with altogether. (See Fig. 13.)

FIG. 13.
Rod pruned bush vine.

A variation of the foregoing plan is sometimes adopted when the rods are twined around a strong central stake more or less spirally. A stake is in all cases an advantage, supporting the growth and creating greater stability against violent winds.

### Trellised Systems.

Grape vines are trained upon trellises for several reasons, the chief of which, under commercial practice, is the utilisation of the vine's vigour to its fullest extent. This is to say, that no matter what claims the respective modifications of the bush system may possess, in many cases satisfactory results can only be assured by systematically training the vines upon a supporting trellis work. This is so, because there are some vines whose strength

and habit of growth render any other method ineffective. Others which may adapt themselves to the bush under conditions of moderate vigour, demand greater scope for growth when placed upon very fertile soils or under irrigation. Take, for example, the Zante Currant, Sultana, Shiraz, Malbeck and Crystal, all of which are most unsatisfactory when trained as a bush vine, no matter whether they be in poor or in fertile soils.

These systems of trellis training are adapted to both the spur and rod-pruned varieties, the scope of development being only limited by the vigour of vines under given conditions, and the distance at which they are planted apart. Thus we find in practice that certain of the weaker-growing varieties are trained generally in a manner adapted to close planting. The same vines will need greater scope for development as the fertility of the soil produces greater amounts of wood. It may therefore be necessary to adopt some different or modified system of training to suit varying conditions. A uniform system of training upon a trellis would be as ineffective as the universal adoption of the bush to all varieties. As the outcome of experience we find that a number of different forms of trellis-training have been evolved, and these are adapted to all class of vines, under a multiplicity of conditions. Instances may be cited of vines such as the Zante Currant, Sweet Water and Crystal being trained in such a manner as to give 30 to 40 feet of main arm. In individual cases they run to much more than this length.

The aim should be in every system to utilise the full length of the trellis as a support to fruit-bearing wood, by building upon it the permanent arms reaching from vine to vine, or by extending annual rods from shorter arms.

It is a more or less popular conception that trellising a vine is simply a matter of allowing the canes to ramble as nature dictates over a supporting framework.

Such is not the case, however, as in the best forms of training the vine is built up step by step upon a definitely conceived plan of construction Such plans have always in view the utilisation of all space for fruit production, and the maintainance of vigorous fruit-bearing wood from year to year. Further, all the systems of trellising take into account the laws of nature with reference to the growth and fruit-bearing of the vine. In this respect it will be found that the greatest measure of success is attained by training the vine in such a manner that the main arms, springing from a vertical stem of varying height, are maintained in a position as near to the horizontal as it is possible to get them. Subsequently the secondary arms, carrying the fruit-bearing wood, are built upon the main arms at regularly spaced intervals. Modifications must, of course, arise to suit special cases, such as, for instance, the creation of two or more sets of main arms at different levels upon strong-growing varieties like the Zante Currant. Wine varieties more generally respond to the simpler forms of training, for the reason that they are mainly grown upon soil of only average fertility.

(*To be continued.*)

# Peach Growing in New South Wales.

W. J. ALLEN.

EXCEPT in a few localities the soil and climate of this State is eminently suitable for growing stone fruit, particularly peaches. Peaches thrive on a great variety of soils, from heavy to light, and with proper treatment have proved one of the most profitable kinds of fruit the orchardist can cultivate.

Heretofore our growers have paid too much attention to dessert varieties at the expense of varieties suitable for canning, and I would therefore recommend that in future more attention be given to the growing of the latter. Even now it is difficult to name several varieties of clingstone peaches which would give a succession of crops that would keep the canneries going from January to the end of March or early April. Not until quite recently have the canners given the growers much information as to the class of fruit they consider most suitable for their requirements. We have, however, many good varieties which are highly thought of by the trade, and we are now in possession of information which we trust will be of assistance to growers who are looking to the canneries to absorb their peaches. It is for intending growers to plant accordingly.

Australia is to-day in a better position than ever she was to compete in the world's markets with jam and canned and fresh fruit, for not only have wages increased in other countries, but the hours of work have been reduced, so that the cost of producing and processing is now practically the same as here. The prices in Australia of tin and other commodities required by the canning trade are also nearer the world's parity than has been the case heretofore. Furthermore, our canned fruits and jams have made such a name for themselves during the war that wherever they have been used they will be again sought after.

There are, however, many markets which have not yet been exploited (Java, for instance, just off our coast, with twenty-four million inhabitants) which should absorb many thousands of cases of canned fruits and jams.

Our growers can produce the highest quality of fruit, and our canneries can treat as much of it as is grown; but one of the most important matters at present is to see that every market in the east, west, north and south should be exploited to find an outlet for any surplus we may have. Australia can produce the goods, and by organisation she can, if she will, find the markets in which to place them. In the early days it was thought that peach-growing in this State would only be successful in a few favoured spots. In recent years, however, it has been found that they do equally well, if not better, in most of the tableland districts than they do in the county of Cumberland.

### What the Canneries Require.

Up to the present the canneries have processed thousands of tons of free-stone peaches, but with the up-to-date machinery in most of the canneries, where the fruit is dipped to remove the skin, and graded and otherwise mechanically handled whilst passing between the receiving and despatching room, it has been found that the firm, yellow fleshed, evenly-shaped clingstone peach of good size (without colour round the stone, and with a small, smooth stone), is preferable for canning purposes. Such varieties will always find a readier sale at higher prices than uneven peaches with large rough stones with colour round them.

**Peach trees in nursery during first summer after budding.**
To be planted out in the orchard next winter

### Choice of Locality.

As already stated, peaches are grown successfully in most parts of New South Wales. In the extreme north-eastern corner peach-growing has not been found profitable, and on one or two of the very high levels, such as the Australian Alps, owing to the occurrence of heavy frosts in almost any month of the year, the prospects of getting a crop are not bright. With these exceptions peach-growing can be undertaken with reasonable chance of success in almost any part of New South Wales. In the very hot and dry portions of the interior, of course, irrigation is necessary.

The prospective peach-grower should select a position within reasonable distance of rail or water carriage, as the carting of this soft fruit long distances tends to bruise it and injure its market appearance, as well as to reduce the net profit.

### Site.

A matter of almost as great importance as the soil is the choosing of a site for a peach orchard. By site is meant the exact situation of the orchard, whether in a valley, on a high-level place, or on a hillside. In the colder climates peach orchards should never be planted in low-lying land or gullies, but on hills or high elevations, so as to profit by good air drainage and be out of the frost level. It is well known that frosts do the most damage in gullies and low-lying places, but along the banks of most of our coastal rivers there has been no injury from frost; although these places are low-lying, some of the best peaches produced in this State have been grown there. A westerly aspect would be the most desirable, if protected from wind. During cold, frosty mornings the thawing process would be more gradual, and frosts would not be so likely to damage the blossom as in the case of orchards planted with an easterly aspect. In early spring, about blossoming time, a drop of one to three degrees in temperature may be very serious, and may cause failure of the crop.

### The Soil and its Preparation.

There are many kinds of soils in which peach trees can be grown profitably. Generally speaking, however, the peach prefers light, warm, well-drained sandy or loamy land. Such a soil favours a firmer, better ripened and hardier growth, and produces fruit of the best colour and quality. Peaches will grow in heavy soil, provided the soil has good drainage and is kept mellow. In such strong soils the trees grow strong and live to a good age. For commercial peach-growing, however, the lighter, loamy soils are preferable.

The ground for peach trees should be thoroughly prepared before planting. It is necessary to plough the land at least 8 or 9 inches deep. In some soils it will be found of benefit to follow the plough with a good subsoiler, breaking up the ground to at least 18 inches. By doing this the roots of the young trees will have a greater depth of moist, mellow soil, and the moisture-holding capacity of the soil will be increased. The objects of the cultivator in the first preparation should be thorough tillage and to bring the soil into a loose and friable condition. Thorough preparation is a great aid to future success, and a well-prepared, friable soil will induce deeper rooting, which is a most important thing.

### Selecting the Trees.

In selecting peach trees for planting, it should be borne in mind that it pays to have good ones, a poor tree being dear at any price. A good tree is one that has made a vigorous, stocky growth. The largest trees are not necessarily the best. Only one-year-old trees should be planted; if not obtainable, dormant buds may be used.

The preparation for planting consists in shortening back the side roots so that they will be not longer than 4 inches. All bruised parts are cut away. The pruning of the top is done some little time after planting, and consists in heading off the tree to the desired height of about 15 inches.

### Stocks.

The peach as a rule prefers a peach stock, and this we recommend for general use. The peach has an affinity, of course, for the plum, apricot or almond, but as it is claimed that the peach is the parent of the plum, apricot and almond, it is reversing the order of affairs to use any of the latter as a stock.

### Laying out the Peach Orchard.

Before laying out the orchard, it is always a good plan to figure out how the trees can be arranged in planting to use the ground to the best advantage.

The whole subject of laying out an orchard is discussed in a publication now in the printer's hands, but the most widely adopted plan is the square system, although some planters favour the hexagonal.

It is appropriate to mention here that it is a mistake to plant trees too close together, as they rob each other of plant-food, and during dry years of moisture also. The latter consideration is an important one, which should not be lost sight of where irrigation cannot be practised. Peach trees are generally planted from 20 to 22 feet apart. The former distance gives 109 trees to the acre and the latter 90 trees to the acre by the square system. With the hexagonal, we get 125 trees to the acre when planted 20 feet apart, and 104 when planted 22 feet apart. For peaches, however, we prefer the trees planted on the square, and 20 feet apart.

### Cultivation.

In the drier districts of the State the rainfall is not sufficient to give the best results with peach trees, unless man's industry aids the trees to obtain greater supplies of moisture than nature provides. This disadvantage is compensated by the great suitability of our warm, dry atmosphere to the production of fine, deliciously flavoured fruit. The latter consideration should induce us to devise and apply every means in our power to supply moisture, as this is practically the only respect in which our central-western lands fall short of being ideal peach country.

Irrigation is the time-honoured method of making good any deficiency in moisture. Where this is not practised, growers or prospective growers should realise the great value of cultivation as a means of storing moisture in the soil. Experiments have shown that, generally speaking, half the rainfall can be stored in the lower layers of the soil by continuous cultivation, and though such statements are usually made in reference to wheat, it is apparent they are just as applicable—perhaps more so—to the cultivation of fruit in our drier districts. It is, unfortunately, too common to see peach and other fruit trees struggling amongst a mass of weeds. These come up in the spring, fed by the manure applied or by the natural fertility of the soil, and they draw moisture from the earth and transpire it into the atmosphere through their leaves. A number of growers are not yet convinced that the benefits resulting from continuous cultivation during spring and summer are sufficient to justify the labour, but they must

eventually find it true that weeds rob the trees of plant food and moisture, and that cultivation destroys weeds and conserves moisture.

Where irrigation is practised cultivation is equally necessary. In the warm districts water will evaporate from the surface of the soil at an extraordinary rate; and even if it can be replaced without much trouble, without cultivation it merely induces a rank growth of weeds, which remove not only moisture but plant-food as well. If our dry lands are to produce their due proportion of peaches, the cultivator in one form or other must play an important part in the work. There are several forms of cultivators—the disc, the spring-tooth, or the fixed tine—each having its merits under special conditions.

Half-case of Peaches well-packed for the local market.

What implements should be used in cultivation will depend largely on the nature of the soil. In light friable soils the mouldboard plough and spring-tooth cultivator will be found the best, but in heavier land better results will be obtained by using the disc cultivator in conjunction with the above. To enable the soil close to the trees to be kept in a nice friable condition, the extension disc cultivator will be found of great utility, minimising the hand hoeing.

### Varieties.

It is now generally accepted that the clingstone varieties are more suitable for canning than the freestone peaches. This has been brought about to a great extent by the advent of up-to-date machinery used in our modern canneries. The texture of the fruit of the selected varieties should be yellow in colour, firm, free from blemish, and symmetrical in form.

The following is a list of some of the best clingstone canning varieties, given in their order of ripening:—Tuscan Cling, Pelora (not yet imported), Sims, Phillip's Cling, Golden Queen, Goodman's Choice, Pullar's Cling, Goldust, Selima.

### Thinning and Picking.

If the trees are bearing a heavy crop the fruit should be so thinned on the branches that the remainder will develop into sizes ranging from $2\frac{1}{2}$ to $2\frac{3}{4}$ inches in diameter. Large peaches are not required for canning purposes.

The fruit should be picked when cool and dry—early in the morning is the best time. It should be fully developed, firm and slightly coloured, and should be placed in shallow boxes and conveyed to the cannery without delay.

### Pruning.

Upon planting the young trees should be headed back to about knee high. During the first year of growth all central twigs should be pinched back, and the tree should be balanced by checking any terminals showing a tendency to monopolise the sap.

In the second year (during the winter) the trees are pruned back to within 9 inches of the crown. The crown may be composed of from three to five branches. These should be selected for vigour and position, so as to form a well-balanced and symmetrical tree. Favour may be shown to the branches on the windy side, care being taken to select vigorous branches for this purpose. From now up to the fourth year the tree is carefully pruned and balanced, cutting to the terminal buds so as to gain position and form

From the fifth year onwards the terminals should not be pruned, and every encouragement should be given to lateral growth. This lateral growth should be shortened and thinned out, in some cases leaving the lateral unpruned. These will carry the fruit. In all cases the centre of the tree should be open so as to admit air and light. Where the growth is vigorous some of the laterals may be completely removed, retaining sufficient to carry a good crop of fruit. From the base from which the laterals have been removed fresh growth will be produced to carry the next season's crop. If it is the habit of the tree to produce spurs, the laterals may be shortened back to 3 or 6 inches.

### Pests and Control.

Peach trees in some districts are subject to the attacks of the peach aphis. Some years ago this pest was responsible for severe losses to the growers, but latterly the trees have been clean, a fact accounted for by the presence of the lady-bird in large numbers. The larvæ of this small beetle devours the aphis, and has succeeded in recent years in practically eliminating the pest.

Where the peach aphis causes dama e it may be controlled by spraying with a nicotine solution. Two to three sprayings during the growing period will be found necessary if the aphides are numerous.

San José scale is another serious enemy of the peach-grower, and should immediately be dealt with upon detection. It may be controlled by spraying (1) with resin and soda (during the summer, after the fruit has been removed), and (2) with miscible oils or lime-sulphur. Either of the latter may be used in the winter. If using lime-sulphur spray, a second application before the buds burst will be found most beneficial.

Fumigation with hydrocyanic gas is another method of control. Fumigation is found to be more successful during the winter months. If properly carried out, one application of gas will be sufficient to clean the trees for one season. In some cases it will permanently clean them unless reinfested.

Curl blight is a fungus disease that attacks the young shoots and leaves, causing the latter to swell to a large size, become contorted, and eventually dry up and fall. This disease may be controlled by the use of lime-sulphur spray. The spray should be applied in the winter and continued up to the early spring, using a weaker solution as the buds burst. Two applications are generally sufficient (the first in midwinter and the second early in the spring), but where the disease has been very prevalent in the preceding summer, it is wise to increase the number of applications to, say, three or even four, before the buds burst.

## Coffee in New South Wales.

The question "can coffee be profitably grown in this State" reaches the Department in some form or other with such frequency that recent correspondence on the subject may be quoted with advantage. The prospect of the local householder gathering his coffee beans as he now does his passion-fruit is a pleasant one; it obviously inspired the newspaper paragraph that prompted the present inquiry, but it is unfortunately obscured by climatic facts.

"I have 70 acres of land 4 miles north of Gulgong, on which I have an orchard, and have installed an irrigation plant," wrote the correspondent. "I would like you to kindly send me some coffee plants and instructions how to grow them. This is a very hot, dry climate, and with irrigation coffee trees should grow well."

"Successful growing of coffee in this State, with the exception of a few particularly well-sheltered positions on the Tweed, is impossible," ran the Department's reply. "Frosts are fatal to the plant, and a fairly even temperature throughout the year, with a rainfall of 60 to 80 inches, is desirable. *Coffea arabica* and *C. robusta* are the two varieties most widely known in the tropics, and a few fairly healthy plants of both are bearing on the Tweed. Apart from the unsuitability of the climate, the high price of labour for picking and preparing the berries would make the crop impossible from a commercial point of view."

# Swarming and Hiving Swarms.

W. A. GOODACRE, Senior Apiary Inspector.

BEES in their natural state depend solely on swarming as a means of ensuring the survival of their species. Some apiarists rely on this natural method as a means of increase, but the more practical men aim at minimising the number of natural swarms, and prefer to depend on artificial methods of increase.

The conditions which induce a colony to make preparation to swarm are—(1) the colony becoming over-populous for the size of the hive, and (2) insufficient ventilation on warm days, causing the bees to cluster outside. Although these conditions are generally observed to be the chief reasons, bees will on rare occasions, without any apparent reason, swarm in spite of all efforts to the contrary on the part of the apiarist. It is advisable, therefore, that apiarists should always be prepared for such an emergency, and should have on hand prepared hives and frames containing full sheets of comb foundation. Hybrid and black bees are more inclined toward swarming than pure Italian.

### Preparing to Swarm.

A colony becoming populous, drones being raised and the bees building embryo queen cells are the first signs that a colony is likely to have a desire to swarm. The next, and a sure indication, is that a good number of eggs are laid in the embryo cells, and the larvæ which are hatched therefrom are fed lavishly with royal jelly. It is wonderful how the bees arrange this preparation among themselves, and it is a recognised fact that scout bees will go out, select a new home, and even prepare it for the colony.

The swarm will usually issue about four days before the young queens are due to hatch from the cells, although conditions may cause the time to vary. Selecting a bright day if possible, the colony suddenly becomes in an excited state, and the bees issue pell-mell from the hive. Practically all the bees that can fly will leave, accompanied by the queen. Under natural conditions they will usually select a place and cluster, a shaded spot about a low bush or shrub being preferred.

### Hiving Natural Swarms.

It is usual for the swarm to cluster near the apiary, and therefore the most convenient method is to carry the prepared hive to the clustered swarm. A frame of brood containing some eggs and larvæ should be put in the prepared hive, the remainder of the frames for the brood chamber to be made up of full sheets of comb foundation. It is not always convenient to shake a swarm into the hive, and a tin dish or bucket to scoop them in with will be found convenient. Tip the first lot into the hive, and dump the remainder near the entrance, care being taken to enlarge the entrance for the time. When the bees have entered the hive, which should give ample accommodation, it can be put on a new stand.

When the swarm has been attended to, the parent colony should be inspected and queen cells removed, leaving one selected for size and appearance. When increase is not desired, the apiarist will place the parent colony, which has been cut down to the brood chamber, alongside the new swarm, with the entrances facing the same way. All queen cells are then removed and the colonies allowed to remain for eight days. Then examine the parent colony, destroy any cells, and place the brood and bees on top of the swarm colony.

If a swarm should cluster on a high limb and no swarm-catching device is on hand, a simple and effective method is to strap a kerosene tin with an open end to a long thin sapling, and work the edge across the swarm so as to cut most of the bees into the tin; then lower and tip the bees into the prepared hive. Repeat the operation, and tip the next lot at the entrance.

### Swarming with Clipped Queens.

It must be remembered that in the case of a clipped queen the swarm will not cluster, for the reason that the queen cannot accompany them for more than a yard or two from the entrance. When the swarm issues, therefore, the apiarist should find the queen and cage her. The flying swarm will then be somewhat under control. The caged queen should be placed in a shaded spot—the pocket for convenience.

The apiarist should get quickly to work and select a frame of brood containing some eggs and larvæ. This is then put in the prepared hive, in the centre of the frames containing full sheets of comb foundation. If desired, this brood can be taken from the parent colony providing there are no queen cells on the brood. Next remove the parent colony and place the now prepared hive on the stand that was occupied by the parent colony, with the caged queen at the entrance. The flying swarm will soon discover that their queen is not among them, and will return to what is now the prepared hive. The supers from the parent colony can be placed on the new hive, but they must be above an excluder and contain no brood. Be sure and give ample accommodation and so save discontent. The queen can be liberated when the bees settle down, which will be about one hour later.

The parent colony is put on a new stand, and if the queen cells on the brood are from a good Italian strain that has been forced to swarm through lack of sufficient accommodation, then the cells when ripe can be made use of, leaving with the colony one cell selected for size and appearance. Only one cell is left in this case to minimise the risk of after swarms. If increase is not desired, remove the parent colony and place the swarm on the stand, treating as previously mentioned.

### After Swarms.

After swarms are a second issue from a colony, and are accompanied by one or more virgin queens which have issued from cells raised during the preparation for the first swarm. It is advisable to return the bees to their home, and this is done by driving them through an excluder to find the queen

or queens, which must be removed. The parent colony should be inspected, and all queen cells destroyed, and then the best-looking virgin should be allowed to run into the hive.

### Absconding Swarms.

It is not unusual for an apiarist to have one or two colonies become dissatisfied and desert their homes; this is more likely to happen during spring. The bees issue and cluster in a similar manner to a natural swarm. Their home should be made as comfortable as possible, with ample stores, and the swarm then returned. In the case of a clipped queen, the work can be carried out while the swarm is flying. Do not experiment with killing the queen and shaking the bees with a weak colony, for they will often cause the queen to be destroyed.

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## Two Processes for Refining Beeswax.

Although beeswax has already been through some process of purification before it leaves the apiarist for the merchant, it is still comparatively rough in many cases. Different methods of refining the product are adopted. Messrs. A. A. Burnett & Co., Ltd., of Sydney, lately communicated to the Department information received by them from a very successful wax exporter, who described his method as follows:—

"I receive the wax in square blocks, purified in the first but poor way in use by the traders in the interior. Here I have proper kettles large enough to melt half a ton, and the taps of which are about 18 inches above the bottom. After being filled with water up to about 2 inches below the tap, the kettle is filled with wax. As soon as the wax commences to boil the fire is taken away, and after a rest of about six hours, the wax is tapped off into the 'forms.' Before turning on the tap I first of all pour into the form a bucket of boiling water so that any dirt which may run with the wax may sink through the water. After twenty-four hours I turn the form out, when I nearly always discover a dark-coloured skin at the bottom of the form touching the water. This is scraped off and the block covered with hessian ready for export."

While commending the foregoing method, Mr. W. A. Goodacre, Senior Apiary Inspector, adds: "A similar method on a smaller scale is generally used by competent apiarists. A vessel is quarter filled with water and the wax added, heat being then applied and the wax melted slowly but thoroughly; it is then allowed to rest for about five hours for the purpose of letting the water and impurities settle. The wax is then drawn off from the top until it shows evidence of coming near the impure matter; it is then usually strained into the form or mould, which should contain a small quantity of hot water. After being poured into the mould it is covered and allowed to cool slowly so as to prevent cracking. In about twenty-four hours it can be removed from the mould and any adhering impurity scraped off. In the commercial handling of wax in large quantities it is often found desirable to use sulphuric acid, about 2 lb. of acid to every 1,000 lb. of wax being necessary when the parcels have first been treated in a poor way by apiarists."

# Poultry Notes.

## FEBRUARY.

JAMES HADLINGTON, Poultry Expert.

IN last month's notes the high prices and scarcity of poultry food were commented upon, but the rise that took place on 2nd January was not then in view. That rise has considerably changed the outlook for 1920, and it has to be realised that, as a result, the poultry industry is likely to receive a considerable set-back.

The gradual rise that had taken place up to the end of last year had been rather more than equalised by the higher prices received for eggs, which almost any gradual rise would bring about; but the big jump mentioned will, as it were, carry poultry men off their feet, particularly as it has occurred when production has commenced to decline, owing to the approach of the moulting season. In the ordinary course of events on a poultry farm, February to July is the most trying period over which the poultry farmer has to finance himself, and it is difficult to see how, under present conditions, many will be able to "weather the storm." It is, however, just as well to realise that this trouble is one of a recurring nature, although it is, perhaps, little comfort for the poultry farmer to be told that similar trouble has occurred before, and will occur again—if not through the agency of a price-fixing board, then in some other way.

As an example of this we might take the drought years of 1888–9, 1901–2, and again 1914–15. There was no Necessary Commodities Commission in those days, but wheat reached 7s. per bushel, and pollard and bran 2s. per bushel, with eggs and table poultry at very much lower levels than at the present time. The inevitable result followed, and from one-third to one-half the hens in the State were sacrificed, simply because their owners could not feed them

This was followed by a contraction of supplies and a rise in the price of eggs, and the poultry farmer who had been able to hold on benefited largely in the succeeding years. Not only were the prices received for his products higher, but the cost of feeding was much lower, simply because the consumption of poultry feed had been reduced. A perusal of the figures given in the Poultry Notes last August will furnish ample confirmation of these statements.

Poultry farmers should therefore consider the whole situation very carefully before abandoning the business or reducing their profitable stock.

Doubtless, a similar result will follow the failure of the wheat crop and general drought in 1919. In none of the years mentioned above was the crop failure the sole cause of the trouble, but in each case it was accentuated by the fact that both bran and pollard, as well as wheat, were being fed to cattle, sheep, and even horses. If the poultry men could see what is fed to cattle in the dairying districts during drought periods, such as we have just passed through, they would at once understand where much of these materials go, and realise that such shortages are inevitable.

### Substitutes.

There is at the present time but little hope of relief from substitutes. One looks around to ascertain what there is available, only to find some minor articles, such as oil cakes. These, too, are not only high in price, but their usefulness is limited from points of view of palatability and digestibility. Lucerne also looms into view as a possible substitute, and it might be said to be one of the very best, but, here again, the poultry farmer finds himself up against a dead end owing to high prices and the difficulty experienced in obtaining good samples. Yet, in this fodder lies his hope of relief beyond the immediate moment.

At the present time the shortage of pollard is so acute, however, that poultry farmers are much concerned to know what to use in its place in the morning feed. Many use wheat, but it will soon be found that dry grain is not appetising to birds that have been used to their morning mash, and they do not take readily to it as an alternative.

The result is a falling-off in egg production. The poultry farmer cannot afford to go on the principle that the birds will eat dry grain if sufficiently hungry. That might work with little loss with non-producing animals, but the palatability of a feed is a very important factor to the poultry farmer. Where materials are not available for the morning mash, the most satisfactory substitute is steamed wheat. The best way to make a good appetising meal of wheat is to bring to the boil just as much water as can be absorbed by the right quantity of wheat, pour the wheat into it and then cover with a bag. Do this at night, and a palatable feed will be available next morning.

### Grow Lucerne.

The objection "lack of moisture" will be raised, no doubt, but very many, probably the majority of poultry farms, are now served with the city or some town water supply. The question of suitable land presents itself perhaps as another bar to the project, but in reality, with the aid of water, it is not. It may not be generally known, but it is nevertheless a fact that lucerne can, with the aid of water and poultry manure, be successfully grown on some of the poorest land in Central Cumberland.

It has been emphasised from time to time in these notes that green lucerne is about the most economical green food that can be fed to poultry—the one class that is most calculated to save the feed bill. Many poultry farmers are finding this out.

Some good examples of the potentialities of lucerne may be seen at Messrs. R. J. Christie and Son's and Whilton Brothers' farms at Eastwood, also at Messrs. Furner and Son's at Carlingford, while at the soldiers' settlements at Bankstown and Campbelltown the settlers are being encouraged to plant lucerne, and some have already very large patches of this, the "king of fodders." Not only can this crop be fed green, but it is one of the easiest to make into hay. Thus it works out, that if more than is required for green food is grown it can be made into hay and be used in the form of chaff to augment the materials used in the morning mash. This is worth the very serious attention of poultry farmers.

The importance of home-grown lucerne to the poultry farmer will be better appreciated when it is stated that some 15,000,000 bushels of pollard and bran are required to feed the poultry in this State, and that at least one-third of this great total could be replaced by lucerne grown on the farms. Even half an acre of lucerne will provide a very considerable amount of poultry food, and every poultry farmer should aim at that area or more.

### How to Grow Lucerne.

Very few poultry farmers will be found on what may be regarded as lucerne land. Taking this fact into consideration and also the poultry farmers' special conditions, the lucerne is best sown in drills 18 inches to 20 inches apart, so that it can be cultivated between the rows. This method also enables poultry manure to be used as a top-dressing, which will, of course, be worked in shallow by the necessary cultivation. It also enables the cultivator to better keep down weeds.

Where some overhead watering system can be arranged, the poultry farmer will be able to cut lucerne almost all the year round.

Some further information in regard to the cultivation of lucerne and the making of it into hay we condense from an article by Mr. A. H. E. McDonald, Chief Inspector of Agriculture, which a few months ago appeared in the *Agricultural Gazette*.

"The actual preparation of the soil for sowing must be directed towards obtaining a very fine surface, together with a firm seed-bed. Where the fallowing has been satisfactory, a deep ploughing before the sowing is not recommended; about 3 inches to 4 inches is quite sufficient, for deeper working simply turns under the sweetened surface soil, brings ungerminated weed seeds to the surface, and makes it difficult to put the seed-bed in the firm condition that is essential. After this ploughing, the land should be thoroughly harrowed and rolled to produce a fine surface, and to consolidate the soil generally. A light harrowing should follow the rolling, except in sandy soils, in which cases the seed may be sown on the rolled surface. If the soil is of a heavy character and inclined to set after rain, the rolled surface must be broken or it will probably become very hard after the first rain.

### When to Sow.

"The time of sowing is determined by the climate and the local weed growth. Generally speaking, autumn sowing gives the most satisfactory results in the west, and is strongly recommended. The autumn sowing produces a crop that becomes well established in the cool winter months, and that stands well the heat and dry winds of the following summer. Spring sown crops do not become so well established before the summer, and are therefore more likely to suffer. The calm weather that is usual in the autumn favours an even stand, while in the spring variable weather and strong winds are frequent and dry out the surface soil, preventing satisfactory germination. As the seed must be kept within 1½ inches of the surface, favourable weather after sowing is absolutely essential to a good stand.

"Under some circumstances, however, the weed growth in the autumn renders sowing at that time unsatisfactory, and if this trouble cannot be overcome spring sowing should be tried. At the same time autumn sowing has so much in its favour that it is worth a special effort to make the weeds germinate early in the fall.

"It is generally considered that lucerne should be well established before frosts occur, but our experience has been that unless the frosts are exceptionally severe the young plants are not injured, even when only just out of the ground. The seeds of barley grass, &c., should be encouraged to germinate as early as possible; then the surface should be stirred to kill the weeds, and the lucerne seed sown while the soil is still warm enough to cause germination, a condition that is common even at the end of May.

"Where spring sowing has to be carried out it should be made about the end of August or early in September in most districts. On the colder tablelands it should be a little later. The weather is then favourable to germination, but the plants still have an opportunity of becoming established before very hot weather occurs.

### The Quality and Quantity of Seed.

"The success of the crop depends more upon the quality of the seed than upon any other single factor. Unfortunately, a certain amount of imported seed finds its way into the State, and in every case in which tests have been made with such seed the crop has been very inferior to crops obtained from seed produced by local growers. Farmers should therefore be very careful to obtain seed from reputable seedsmen, and locally-grown seed should be specified even if it costs a little more. Of the varieties grown here, Tamworth and Hunter River are practically similar in character, while Mudgee lucerne is of a finer type. A good sample of seed should be sound, mature, plump, bright, and reasonably even in size; it should contain no dodder nor any weed seed.

### Haymaking.

"Lucerne should be mown just after the first flowers are out. If cut at this time the best hay is obtained, and the succeeding growth is stronger. After mowing, care is required in handling to prevent loss of the leaves, which are

the most valuable part of the hay. Generally the raking should be commenced at midday to get all the hay cut that day into the windrows before dark.

"In very hot, dry districts the rake should be following the mower and the cocking done immediately. In milder climates the hay should remain in the windrows a few hours.

"Where the weather conditions make it probable that hay is likely to mould in the cocks, they should be gently turned with the fork.

"The time the hay remains in the cock depends on the weather. When it is fine and hot two days are sufficient, but when mild or cloudy it may have to remain four or five days, or even more. Only experience teaches at what time lucerne should be put into the stack. The stems are more likely to be the cause of trouble than the leaves, as they take longer to dry. When handled the hay should have a crisp feel rather than a dead, damp one. If the hay is allowed to become too dry, a considerable loss will occur through the leaves falling, while on the other hand there is a danger of hay which is brought in too fresh firing in the stack; but any farmer with a little experience with hay will find that in a short time he is able to cure a fair sample."

## Vineyard Notes for February.

Summer rains of December have benefited the grape crop to no inconsiderable extent, and reports from various sources indicate a fairly satisfactory return for the coming vintage. Throughout the county of Cumberland there has been a rather serious outbreak of downy mildew and some black spot, but where spraying had been carried out in the earlier part of the season no harm has been done. The disease was mainly confined to the young growth, and to a certain extent to the fruit. In one instance, where the vines had not been sprayed with Bordeaux mixture, a considerable portion of the crop had become affected and destroyed.

Although the presence of the disease in the vines is to be regretted it is, in a sense, a good thing, in so far that it has been the means of making growers realise the danger of apathy in respect to spraying. At the same time it has demonstrated the efficacy of recognised sprays. When full realisation of the value of home-made Bordeaux mixture takes place and patent mixtures are avoided, there need be no great fear of either downy mildew or black spot.

With the removal of the fruit from the vines, they have still to mature their wood. This depends upon the retention of the leaves; and it must be borne in mind that the success of the next year's crop is influenced by the manner in which the vines finish their vegetative functions. A thorough spraying after the crop has been gathered will be of great value should showery weather be experienced, with a consequent recurrence of disease. After vintage, continue the general cultivation, loosening the soil and keeping down weeds.

Young resistant vines should be "Yema" budded, and a pamphlet dealing with this operation can be secured on application to the Department.—H. E. Laffer, Viticultural Expert.

# Orchard Notes.

## FEBRUARY.

W. J. ALLEN.

LITTLE or no cultivation is necessary during this month, except where irrigation is practised. The most important work will be the handling of the main crops, and the picking, packing, and marketing of same. Attention may be drawn to the fact that many growers fail to realise the importance of picking their fruit early in the morning, when it is cool, grading it while it is cool, and packing it while it is cool. If growers would adopt this method they would be well recompensed for early rising by increased returns.

The great necessity for grading cannot be too strongly emphasised. It may be mentioned that certain Sydney fruit agents have brought under the Department's notice the effect which grading has on the prices realised on the market for fruit. In half-cases of certain recent consignments there was large fruit of good quality, mixed with small and indifferent fruit. These half-cases were difficult to sell at 4s. 6d.; on the other hand, there was a big demand for well graded apricots, which realised from 10s. to 12s. per half-case.

Zante currants will be ripe at the end of this month. Care should be taken to allow the bunches to ripen thoroughly before picking. Some varieties of pears, such as Williams, will be ready for picking at the beginning of the month. This pear should be picked when it is green.

### Work in the Citrus Orchard.

While this is considered one of the best months for carrying out fumigation, under no circumstances should it be done if the trees are out of condition through lack of moisture in the soil. A tree suffering from drought, or want of cultivation, can easily be damaged by either spraying or fumigating. Fumigation should be carried out at night, or during the cool part of the day, always avoiding hot days. During recent years we have carried out fumigation work in March and April, so as to avoid the hot weather of February. This seems to have been satisfactory, and the scale has been killed and the trees kept free from damage.

In citrus orchards, where good rains have fallen, it is now a good time to plough. On steep hillsides, and where land is liable to wash, shallow ploughing (the ground being left in the rough) seems to be the best practice.

It has been found in the coastal districts that this month is a suitable time to apply artificial manures to citrus trees, especially where the trees have received a good supply of moisture.

### Diseases.

San José scale, codlin moth, woolly aphis, and scale insects of citrus trees are the principal insect pests which require attention this month. Growers in doubt as to any disease attacking their trees should either communicate with the district Fruit Inspector or forward specimens to the Department of Agriculture without delay.

### Irrigation.

Dry seasons occur at intervals in our coastal districts. The result is that very often bearing citrus trees suffer considerably, causing them to drop their fruit. Some experienced growers have installed small pumping plants with a view to supplying the necessary moisture when dry periods prevail. One cannot too highly recommend this procedure, as for a very long time there has been need of overcoming the difficulty of protracted dry weather. Trees or vines which have not had an application of water for some time will, in all probability, require one this month in districts where there has been no recent rain. In applying water, the land should be well soaked to a good depth, and immediately the soil is dry enough, the cultivator should be put at work and the land well stirred by at least two cultivations after each irrigation. Cultivation should be completed five days after irrigating.

### Cover Crops.

The sowing of cover crops appears to be a satisfactory means of increasing the organic matter in many of our lighter coastal soils. Arrangements should now be made to procure seed for sowing and to prepare the land. No doubt there will be some difficulty experienced in obtaining such seed as vetches and other legumes, unless provision be made immediately. Fruitgrowers are, however, not confined to legumes, as Skinless barley, rye and rape are satisfactory for turning under.

## The Department and Elephant Grass.

Elephant grass (otherwise Napier's Fodder), a native of Africa, has only in recent years attracted attention as a fodder plant, and it was not till ten years ago that the South Africans commenced to cultivate it for that purpose. When, two or three years later, the reports of the South African trials were published, the New South Wales Department of Agriculture introduced it into this State, and its behaviour at once recommended it to farmers as well as to officers of the Department, a report by Mr. E. Breakwell, Agrostologist, in the *Agricultural Gazette* of July, 1917, setting out quite phenomenal results. The reports were evidently perused with profit in the United States of America, for the May issue of the Philadelphia *Country Gentleman* relates how a farmer in California obtained seed from the New South Wales Department, and describes with enthusiasm the remarkable growth he obtained. The Department has thus not only introduced the grass into New South Wales, but has contributed to its use in other lands.

# Agricultural Bureau of New South Wales.

### Suggested Subjects for Bureau Meetings.

**It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—**

*Has your experience of the past two years led you to decide upon any change in your farm practice? Is it your intention to increase or decrease the number of live stock you are grazing? If you propose to increase, in what direction will it be—sheep, cattle or pigs—and why?*

*Which have given you the more satisfactory results—early sown wheat crops or late ones? Does your experience warrant sowing early any land you have ready, or do you prefer waiting until the whole area to be sown has been prepared? What guides your preference? Would you favour using the spring-tooth or the disc cultivator in order to prepare quickly for early sowing a great deal of the land that was sown last year but that carried no crop?*

*Have you ever sown catch crops of clovers, field peas, rape or vetches among growing maize for stock feed or soil improvement? What effect have you observed on the growth of the current maize crop, or the next crop, whatever it may be?*

*What value do you attach to a ton of green feed for dairying purposes when natural pastures are bare? Have you any definite idea of the effect on the milk yield of green feed at such a time? What do you estimate to be the cost of producing fodder of that kind?*

*What sort of growth did you have with green manure crops in the orchard last year? Have you ever found any difference between early and late sowing for this purpose? What class of crop gives the biggest yield of greenstuff if sown early?*

### Notice to Secretaries.

Secretaries of branches are informed that material incidental to bee-keeping (including super frames, foundation comb, mailing cage for queens, &c.), together with a leaflet containing directions as to their proper use, may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney. The collection is all that is necessary for a sound demonstration of the elementary rules of bee-keeping, and should be widely made use of as a means of helping the intending apiarist to a "straight start" in the industry.

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.*

### Clovass.

At a well-attended meeting held on 7th October, a paper on the management of a dairy farm was read by Mr. W. G. Johnston, Dairy Inspector, Casino. Many aspects of the business were touched upon, the value of good clean buildings and the avoidance of anything likely to favour disease being particularly emphasised.

### Cordeaux-Goondarin.

A meeting of this branch was held on 4th December, twelve members being present. General business, including the purchase of fertilisers, &c., by members on co-operative lines, was dealt with during the evening. Two new members were enrolled.

### Cotta Walla.

A meeting of this branch was held on 8th December, when the question of "Bush Week" was discussed, and it was decided to co-operate with Crookwell district in staging an exhibit. It was realised that the task was a difficult one, as the district was passing through the most severe drought ever experienced. Members hoped, nevertheless, to make a creditable showing.

### Dural.

At the last meeting the following answers to questions in the *Agricultural Gazette* were arrived at :—

It has not been found necessary in the Dural district to grow other plums to fertilise the Satsuma. This applies to most varieties of Japanese plums grown here. The plum crop in this district is the lightest for many years. This is attributed to sudden changes of temperature, which occur frequently during that critical time when the fruit is just setting.

Cross-pollination is considered necessary for the Jonathan apple, and the following varieties are recommended for that purpose :—King David, McIntosh Red, Thompson's Seedling and Fanny.

### Kellyville.

A meeting was held on 6th December, when general business was discussed. Sample packets of Saccaline seed were distributed amongst members for trial purposes. Members decided that they would start preparing the exhibit to be staged by the branch at the coming local show.

On the resignation of the chairman, Mr. J. Nutter was elected for the ensuing year.

### Lidcombe.

A meeting of this branch was held on 1st December, forty-five members being present.

During the evening Mr. W. W. Edwards read a paper on the growing of vegetables. He dealt mainly with the growing of the cabbage, cauliflower, lettuce, onions, beetroot, turnips, carrots, beans, tomatoes, kohl rabi, and other vegetables. The following paper was read by Mr. J. T. Hillson :—

#### The Land and its Preparation for Growing.

The whole of our success in gardening depends not so much on what we plant in land when it first comes into our possession, as upon the kind of soil the land is composed of, and also the way in which we prepare it for growing. One could take up the whole of the evening in the discussion of the draining of the land.

While all land requires breaking up, draining and sweetening, much depends upon what use we intend to put it to. For instance, while 4 or 5 inches is a quite deep enough ploughing for wheat, it would not be deep enough to grow fruit. Nor can we expect to grow good fruit without it, the reason being that the fruit tree has to occupy the land for many years. Many an orchard for a few years has looked well to the casual observer, but after a time has become diseased and died out, either through lack of drainage or improper preparation. In one such orchard the owner dug deep holes; he then collected leaves and bush scrapings, filled up the holes and planted his trees. But there was no drainage. Consequently, when a spell of wet weather came his trees perished.

If there is one thing more than any other that the soil of County Cumberland is noted for, it is for its poorness. It is deficient especially in lime and potash, and when the Agricultural Department a few years ago tested some 130 soils from different parts of the county its capacity for water was put down as nil.

There are two classes of soil in this county; that lying between Sydney and Penrith east and west, and the Kurrajong and Picton, north and south, rest upon, and are derived from Wianamatta shale. The second division, being the rest of the County of Cumberland, is derived from the Hawkesbury sandstone. Both these formations are remarkably poor in constituents suitable for plant food. But although this applies generally to the soils of County Cumberland, there are isolated spots, here and there, which contain richer soil, for instance, at Prospect. The whole of that hill rests upon what we call blue-metal and the soil is good. One vein from it runs through part of Dundas. Another crops out at the boundary of Lidcombe and Auburn near Park-road (where stone was obtained some years ago), and then passes through Lidcombe, where it was worked over thirty years ago. This causes the soil to vary in patches. Just across Park-road, within a distance of a few hundred yards from the blue-metal patch, you can see sandstone above the ground. The soil there is poor and hungry. The timber which grew on the two soils was quite different. Near where I am living immense logs of red and white mahogany used to be cut some fifty or sixty years ago, and a man named Carter had teams, with which he drew them to the river, from whence they were taken to Sydney.

The soil in County Cumberland requires humus and plenty of it. A second requirement is an occasional dressing of lime to sweeten it and prepare the humus for the crop, but as our soils are deficient in organic matter, be cautious with the lime. Break your idle land up roughly, and leave it to the sun and air to sweeten.

Remember that—

Lime and lime, without manure,
Makes both farm and farmer poor.

So do not forget to keep up the humus in the soil, supplying cow or horse manure, as well as lime; otherwise you will soon find your land burnt out.

Now, suppose a man has come to the district, has purchased a piece of land, and intends to make a home, with a vegetable and flower garden, and a few fruit trees. The land is not cleared; it has the usual scrub on it, some trees and stumps, and he has to grub out the scrub by the roots and gather it up into heaps. Then he must grub out the trees to at least 18 inches in depth, and any stumps must also be taken out to the same depth. Having got the trees down and the stumps out, the trees can be cut up and, with the stumps, drawn out of the way and stacked near the house, to be used as firewood. Unless the scrub is heavy, I would not advise burning it, but would prefer using it for draining, or even burning on top of the land when ready to plant.

The next thing is to mark out the site intended for the garden. Then find out the lowest point of the site and drive in a stake for future guidance, and proceed to mark out the main drain, the position of which depends on the size of the garden. If very large it should run along the centre, and the side drains should run into it diagonally. If the area is fairly large the main drain can run from the bottom to the top, on the lowest side of the ground. If the garden is only small, the main drain can run across the bottom and the feeders may run straight into it.

In clay subsoils the side-drains, or feeders, should be about 15 feet apart, and in loam they may be 20 feet apart. This will give ample drainage.

The drains should be cut V-shape and at least 2 feet 6 inches in depth. The width of the bottom, which should be flat and well graded, will vary according to the material that is used to construct the drain. For field culture the drains may be open, but for gardens—which we are now considering—either pipes, tiles, rubble, or saplings covered with scrub are serviceable. Pipes are the best of all, and the side drains should be 2-inch agricultural drain pipes; for main drains at least 3-inch pipes. Tiles are the next best material; these should be half-round, and covered with flat tiles. Some use the flat tile on the bottom, but it is not so good, being more likely to get choked. Rubble makes a good drain if covered with gravel or small stones and clay and rammed. The brush drain is the worst, but if a man is not in a position to buy the other material it will last a long time if well made.

Special tools are used for draining, but unless one has a lot to do they should not be purchased as they are expensive.

If possible, start on the surface and dig a trench with a slight grade until you reach the depth of the drain. Draining is more important than trenching because it allows the

water to pass through the ground, instead of over the top of it. Rain water contains air, ammonia, and carbonic acid gas, and the more that passes through the soil the better. Moreover, draining aerates the soil; when the rain passes through it draws the air after it.

We now come to the digging or trenching of the ground. If we decide to trench, it should be done to the depth of 15 inches or 18 inches. Perhaps it would be best if I described the way I trenched a piece of land in Lidcombe. It may seem very laborious, but if the place is your own it is worth it, as the increased fertility is permanent. In the first place, mark out a width of 4 feet across the lowest part of the ground, dig out the top soil, and wheel to the highest part of the plot. Then mark out 2 feet across the subsoil, dig that out to the depth you intend to trench, and wheel this soil also back to the top. If you have not used the scrub for draining, you can now lay some of it at the bottom, turn the other 2 feet of subsoil on the top of it, and sprinkle a little fresh slacked lime on it. Then mark out 2 feet of the next piece of land, dig off the top spit, and put it on top of the subsoil. Continue working this way until the whole bed is trenched, and the soil taken off the bottom is filled in at the top end.

Should you not wish to go to this trouble, however, and still wish to trench, mark off 2 feet across the bottom of the bed, dig out the top spit and wheel it to the top. Dig up the subsoil, sprinkle a little lime on it, turn the top of the next 2 feet on top of the subsoil, and thus continue through the bed. Having finished the trenching and levelled the land, if you still have the scrub on hand spread it over the land, and put a running fire through it. If the land is on a slope, you are now ready for the planting. If it is flat or swampy, it will most likely be sour, and will require liming, after which you will have to wait three weeks before planting anything in it. Be cautious with the lime, if the soil is anyway sandy, because ½ lb. lime to the square yard is over 1 ton 1½ cwt. to the acre.

## Lower Portland.

A meeting of this branch was held on 1st December, when there was a good attendance, and two new members were elected. An interesting paper on the making of wine was read by Mr. R. M. Smith.

## March.

A meeting was held on 15th December, when the following papers were read and discussed:—

"The Starling Pest," by Mr. Hubert Griffith, and "Notes on the Starling," by Mr. J. Swan, Fruit Inspector. A discussion on "Predominating Timber" also took place.

As regards the last, a member of the Stratford branch lately opined that the predominant timber in a locality was the most durable. While members disagreed with the theory, it was also stated that in certain localities the predominating timber was the longest lived. As a general rule, however, members held that such was not the case. Instances were quoted in the locality and from most of the Blue Mountains. Stringybark, though not an extremely common tree on the Blue Mountains, was very much used for fencing purposes, and people had posts carted considerable distances in preference to using the predominating local timbers. Further, timber from ridges was more lasting than that obtained from the lower parts, and posts set in low ground lasted longer than those set on ridges on account of the lower lands being moister. Those on hilly, stony ground always rotted at the ground line.

## Milbrulong.

A meeting was held on 1st December, at which sixteen members were present.

During the evening a debate took place on the question, "Which Pays Best—Wheat for Hay or for Grain?" Mr. F. W. Gollasch was the leader for grain, and Mr. P. J. Lynch the leader for hay. Mr. H. Chapman acted

as adjudicator. The area under crop debated on was 300 acres, and an average yield of 4½ bushels per acre of grain and 7 cwt. per acre of hay was considered reasonable for the present season.

Mr. F. W. Gollasch, in opening the debate, said he did not think, taking the present season into consideration, that it was only a question of direct profit to the farmer but also a serious question of (1) supplying fodder for stock on hand, (2) supplying seed wheat for the next season, and (3) the profits, if any, due to the sale of surplus wheat or hay. Further, there would be more income derived from the sale of surplus grain than from the sale of surplus hay. The surplus wheat could be graded and sold as seed wheat at 7s. per bushel. There was also the cocky-chaff, which could be collected and fed to the stock.

Mr. P. J. Lynch thought there was more profit in cutting for hay, valuing hay at 8s. per cwt. in the stack, and a yield of ½ ton per acre.

Mr. J. Garret, in supporting grain, remarked that after a farmer had cut down 80 acres of hay for his own use, he would have 220 acres to strip, which, averaging 4½ bushels per acre, would yield 990 bushels, of which 300 bushels would have to be retained for seed; this would result in a profit, due to the sale of 690 bushels.

Mr. W. Mackaway, advocating hay, considered that a 7 cwt. crop of hay at 8s. per cwt. was more profitable than 4½ bushels at 7s. per bushel.

Mr. T. Roche, for grain, stated he thought it was impossible for a farmer to cut down the whole of 300 acres of hay. At least 50 per cent. of the crop would be too short to cut for hay, and would have to be stripped for grain.

Considering the cost of producing a crop for hay is equal to that of producing a crop for grain, the meeting arrived at the following decision:—

300 acres for grain—

| | |
|---|---|
| 80 acres to be cut for hay for stock on hand. | |
| 220 acres stripped, 4½ bushels per acre ... ... ... ... | 990 bushels. |
| 300 bushels to be retained for seed wheat, leaves a balance of 690 bushels for sale at 7s. ... ... ... ... ... | £241 10 0 |
| Less grading 690 bushels at 3d. per bushel ... ... ... | 8 12 6 |
| Profit ... ... ... ... ... ... ... ... | £232 17 6 |

300 acres for hay—

| | |
|---|---|
| 150 acres (not fit to cut for hay) stripped for seed, averaging 2 bushels per acre ... ... ... ... ... ... | 300 bushels. |
| 100 acres cut for hay for stock on hand. | |
| 50 acres cut for hay for sale, yielding 7 cwt. per acre at 8s. per cwt. | £140 0 0 |

| | |
|---|---|
| Income from grain ... ... | £232 17 6 |
| ,, ,, hay ... ... | £140 0 0 |

It was considered that 80 acres cut for hay, together with the cocky-chaff gained by stripping, was equal to 100 acres for hay.

### Miranda.

On 1st December Mr. H. G. Smith, Apiarist at the Hawkesbury Agricultural College, delivered a lantern lecture to the members of the branch. A large number of members and visitors were present, and many questions were asked. On the following day a demonstration was given in a local apiary in the morning and another at Port Hacking in the afternoon, when the handling of colonies for honey production and the swarming problem were discussed.

### Penrose-Kareela.

A meeting was held on 13th December, when the following office-bearers were elected for the ensuing year:—Chairman, Mr. H. Tendt; Vice-Chairman, Mr. O. Clews; Treasurer, Mr. V. S. James; Hon. Secretary, Mr. C. Aye.

### Springside.

A meeting was held on 4th November, there being an attendance of twenty-eight members.

Mr. Swan, Fruit Inspector, addressed members during the evening, dealing mainly with insect and fungoid pests and their treatment. It was announced that the prize offered in connection with crops which were judged by Mr. B. C. Meek, Assistant Inspector of Agriculture, was won by Mr. Jos. Selwood.

During the evening Mr. E. H. Selwood read a paper on co-operation, in which he strongly advocated that producers of all kinds (including industrialists) should co-operate to eliminate some of the numerous hands through which produce must pass to the loss of all. "The imperfections of the present industrial fabric are apparent to all, and that a drastic change is necessary is also quite apparent. From this movement will spring the reorganisation of production, of food supply, banking, finance, education, and many other organisations which are indispensable to the happy progression of a young nation."

### Stratford.

A successful meeting was held on 6th December, fifteen members being present. It was decided to stage a non-competitive exhibit at the Gloucester show to be held in March next. General discussion took place on several subjects, including the sharpening of hand saws, introduced by Mr. T. Germon. An address was also given by the secretary on diseases of farm stock.

Several gentlemen present signified their intention of enrolling in the near future.

### Wellington.

At a meeting on 1st December, Mr. R. G. Harvey presiding, the principal business was an address by Mr. Pedersen, Dairy Instructor of the Department of Agriculture.

Mr. Pedersen said that the first principle of dairying was good land and a good supply of clean water. As it came from the cow, milk contained 87 per cent. of water, and if the water which the cow drank was not good it was bound to have a detrimental effect on the milk. Good green grass or other feed of the kind was an essential to good milk, the flavour, taste and smell being largely governed by the food and water consumed by the animal. Cleanliness must be practised in and around the dairy, the udder being rubbed down with a clean wet cloth and then with a dry one before milking was started.

The various breeds of cattle favoured in Australia were discussed by the lecturer, who, on the whole, favoured the Milking Shorthorn for the Wellington district on account of the large flow of milk and the good average standard of the cream content. The breed seemed to be on the way to overrun all other breeds in such country, and a type of Shorthorn was being produced that put on flesh rapidly as it went dry, and when it came into milk again used up the fat in making the milk.

A demonstration in summer pruning was given by Mr. W. le Gay Brereton at Mr. T. Parke's orchard, Curra Creek, during December, and on the evening of the same day he lectured to a number of members and others on the subject of fruit-drying. He remarked that drying was a method of disposing of reject fruit in the case of apples and pears, but with stone fruit (particularly peaches, apricots, plums and prunes) only certain varieties should be used for the purpose and then only at a proper stage of ripeness. The method of drying various fruits was carefully described, and many valuable suggestions were made concerning the process.

### Woonona.

The monthly meeting was held on 9th December, when nine new members were admitted. Mr. Fowler read an interesting paper to members entitled "How a Plant Grows."

### Yarramalong.

A meeting was held on 26th November, and during the evening a lecture on pig-raising was given by Mr. E. J. Shelton.

#### Profitable Pig Farming.

Mr. Shelton dealt with the subject under three headings, viz., (1) breeds and control, (2) feeding and management, and (3) marketing. The extent to which the industry had developed in other lands, indicated its possibilities, said the speaker. Last year the figures representing the number of live pigs in the different countries were as follows:—

| | | | |
|---|---|---|---|
| United States of America | 67,453,000 | United Kingdom... ... | 2,998,657 |
| Brazil ... ... ... | 17,329,210 | Argentine ... ... ... | 1,197,337 |
| Austria-Hungary ... ... | 7,580,446 | Australia ... ... ... | 1,141,132 |

There was no country more suited to the production of live stock than Australia, and every pork and bacon buyer in the State would willingly purchase and pay higher prices for at least ten times the number of pigs available. Nor was there any need to fear a y permanent glut in the market. For the next few years they were not likely to see even the occasional glutted markets of the past.

There were four common breeds of pigs in Australia, viz., Berkshire, Yorkshire (medium and large types), Poland China, and Tamworth. All had certain special advantages, and all could be handled with profit. The Berkshire was the most popular and most extensively bred, but the Middle Yorkshire was a close runner-up. It was rather more prolific than the "Berk," but required more attention and must have plenty of shade and protection from both sun and rain. The Large Yorkshire was essentially a bacon pig, and though of great value in the United Kingdom and Canada it had not gained any popularity here. The Poland China, so wonderfully popular in America, and a thoroughly reliable and growthy pig, had been in the background for many years, but was now slowly forging ahead. A Poland China boar mated to Berkshire or common type sows made a great deal of difference in the annual returns. The Tamworth was distinctly a bacon pig, suited to cross-breeding with Berkshire and similar type pigs for the production of medium to heavy baconers. Where haulage to market was an item, it was well worth considering the production of bacon pigs instead of porkers. In a general way, where the farmer was close to market, porkers paid the best, as returns were more regular and the money was turned over more frequently.

As to feeding and management, it was observed that the only way to make money out of pigs was to keep them on the move all the while. Their growth should never be allowed to suffer a check, for they would probably never make the same type of animal once they ceased growing for a while.

Skim milk was no more a balanced ration for pigs than porridge for a human being. It was a necessary and appetising addition to the food and of great value, but it needed some concentrated addition. Amongst the most suitable foods for this purpose were pollard, wheat meal, pea meal, maize meal (when cheap enough), biscuit meal, or some other cereal by-product. These foods were all expensive at the time and likely to continue so, and farmers must therefore add some form of green food such as lucerne, green maize, sorghum, kale, rape and barley, artichokes, pumpkins, melons, &c., These made up the flesh forming portion of the food. The concentrates were the fat formers.

The production of the food on the farm and its proper utilisation with attention to all the details of management counted for much. It was useless to expect the stock to care for themselves. Under these conditions they quickly reverted to the wild state, in which they were entirely unprofitable. Profits would be made only by careful forcing of the animal from birth to maturity.

Bacon pigs should weigh 120 lb. dressed in six months from birth. This meant they would weigh alive from 145 to 150 lb. In other words, the pig when weaned at, say, eight weeks old weighed 30 to 35 lb. live weight; in the succeeding four months he had to put on over 100 lb. in weight, and as four months was approximately 120 days, he must put on at least 1 lb. per day. This would rise from say ¼ lb. per day at three months to ½ lb. per day at four months, 1 lb. at five months, and 1½ lb. between five and six months.

Porkers would weigh 80 lb. dressed, at say four and a half or five months. These weights were not by any means uncommon, yet how few there were whose stock reached them as a standard.

A number of young pigs were lost while still with the mother. This percentage varied from 30 to 50 per cent., but it should not be more than 10 per cent. at the outside, and the loss could to a very large extent be prevented by careful management and proper housing.

Diseases such as "scour" in young pigs carried off a large number, as also did "pants" or pleurisy. Many sows suffered from milk fever, often the result of constipation and general anæmia. Many young pigs were overlaid at birth, many were born dead, and many lingered on, too weak to last more than three or four days. This loss could be prevented to a very large extent, or at least could be partly controlled by a proper knowledge of the business, by giving it untiring care and attention. The farmer who was so careful as to prevent a great number of the losses in his young stock, and who succeeded in raising a large percentage to maturity, often lacked judgment in the selection of the means by which he would market his stock. There were several markets for pork and bacon pigs, in addition to a good local demand for stores. Mr. Shelton's advice was that farmers should visit the abattoir pig sales and see the way in which stock was handled and sold, see the types that sold best, and note the quality, evenness, grading, and general superiority of a good type animal. Pigs and calves should be properly branded, and the agents advised of the lot beforehand or at the time of despatch. The market was always ready to receive good class porkers, baconers and backfatters. Let them send in good quality stock, evenly graded, and properly topped, and a reputation for their pigs and a profitable price would be the result.

## Sudan Grass and Rape in the Central Western Districts.

"Will you please tell me the price of Sudan grass seed and rape seed, and how much is sown to the acre," wrote a western correspondent to the Department. "I have a paddock ready of 772 acres, and want to sow with half of each."

The writer was informed in the following terms:—"Sudan grass is sold by Sydney seedsmen at 3s. 6d. per lb. This increased price is due to the scarcity of seed, and should be much less next year. It is recommended that only a small area be sown this year, from which sufficient seed could be harvested to fulfil requirements next season. Four to six pounds per acre, in drills about 3 feet apart, is sufficient.

"Rape seed is sown at the rate of about 4 lb. per acre, the best practice being to put it in drills 2 feet 6 inches to 3 feet apart. It can be sown either through the grass seed box attached to the wheat drill, or by mixing it with superphosphate or dry earth and sowing through the fertiliser box; the rows can be spaced by closing up some of the hoppers. The price of the seed is about 1s. per lb., and the best time for sowing is about the end of February. We are unable to recommend rape for your district, as we have found that it is only in good seasons that it proves successful; we have found that better crops for grazing are obtained by sowing oats or wheat."

## The Pine-tree Borer Active.

Specimens of the pine-tree borer (*Diadoxus scalaris*) reached the Government Entomologist through the Forestry Commission from two separate sources quite lately, suggesting that this beetle is again becoming active. During serious droughts in the west pine trees are very subject to its attacks, while in normal seasons only the small pine seedlings suffer.

# AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Central Cumberland A. and H. Association ... ... | H. A. Best | Feb. 13, 14 |
| Ulladulla A. and H. Association (Milton) ... ... | R. F. Cork | ,, 18, 19 |
| Dapto A. and H. Society ... ... ... ... | F. James ... | ,, 20, 21 |
| Wyong District A. Association .. ... ... .. | C. N. Walters ... | ,, 21, 22 |
| Alstonville A. Society ... ... ... ... ... | C. D. McIntyre ... | ,, 24, 25 |
| Inverell P. and A. Association ... ... ... ... | J. T. Dale | ,, 24, 25, 26 |
| Southern New England P. and A. Association (Uralla) | H. W. Vincent ... | ,, 24, 25, 26 |
| Dorrigo and Guy Fawkes A. Association ... ... | R. R. Blair | ,, 25, 26 |
| Gunning P., A., and I. Society ... ... ... | S. A. Beer | ,, 25, 26 |
| Newcastle A., H., and I. Association ... ... ... | E. J. Dann | ,, 25, 26, 27, and 28. |
| Yanco Irrigation Area A. Society ... ... ... | R. Tribe ... | Mar. 2, 3 |
| Tenterfield P., A., and M. Society ... ... ... | E. W. Whereat .. | ,, 2, 3, 4 |
| Tumut A. Association ... ... ... ... ... | T. E. Wilkinson... | ,, 3, 4 |
| Manning River A. and H. Association (Taree) ... | L. Plumer | ,, 4, 5 |
| Berrima District A., H., and I. Society ... ... | C. E. Wynne ... | ,, 4, 5, 6 |
| Wollongong A., H., and I. Association ... ... | W. J. Cochrane ... | ,, 4, 5, 6 |
| Nepean District A., H., and I. Society ... ... | C. J. Welch | ,, 5, 6 |
| Bangalow A. and I. Society ... ... ... ... | W. H. Reading ... | ,, 9, 10 |
| Glen Innes and New England P. & A. Association ... | G. A. Priest | ,, 9, 10, 11 |
| Mudgee A., P., H., and I. Association ... ... | E. J. Hannan | ,, 9, 10, 11 |
| Gundagai P. and A. Society ... ... ... ... | H. W. Simpson ... | ,, 10, 11 |
| Moruya A. and P. Society ... ... ... ... | H. P. Jeffery | ,, 10, 11 |
| Tumbarumba A. Association ... ... ... ... | W. R. Figures ... | ,, 10, 11 |
| Hunter River A. and H. Association (West Maitland) | E. H. Fountain ... | ,, 10, 11, 12, and 13. |
| Hastings District P., A., and H. Society ... ... | A. D. Suters | ,, 11, 12 |
| Armidale and N.E. P., A., and H. Association ... | A. McArthur | ,, 16, 17, 18, and 19. |
| Cobargo A., P., and H. Society ... ... ... | T. Kennelly | ,, 17, 18 |
| Macleay A., H., and I. Association .. ... ... | E. Weeks... | ,, 17, 18, 19 |
| Camden A., H., and I. Society ... ... .. ... | A. E. Baldock | ,, 18, 19, 20 |
| Goulburn A., P., and H. Society ... ... ... | F. D. Hay | ,, 18, 19, 20 |
| Campbelltown A. Society ... ... ... ... | J. T. D. Earl | ,, 23, 24 |
| Taralga A., P., and H. Association ... ... ... | J. J. Kearney | ,, 24, 25 |
| Upper Hunter P. and A. Association (Muswellbrook) | R. C. Sawkins | ,, 24, 25 |
| Walcha P. and A. Association ... ... ... ... | S. Hargrave | ,, 24, 25 |
| Royal Agricultural Society of N.S.W. ... ... | H. M. Somer | March 29 to April 7. |
| Batlow A. Society ... ... ... ... ... ... | C. S. Gregory | April 13, 14 |
| Bathurst A., H., and P. Society ... ... ... | S. V. Turrell | ,, 14, 15 |
| Upper Manning A. and H. Association (Wingham)... | D. Stewart | ,, 21, 22 |
| Dungog A. and H. Association ... ... ... ... | W. H. Green | ,, 28, 29, 30 |
| Corowa P., A., and H. Society... ... ... ... | J. D. Fraser | Aug. 17, 18 |
| Parkes P., A., and H. Association .. .. ... | G. W. Seaborn .. | ,, 18, 19 |
| Murrumbidgee P. and A. Association (Wagga) ... | A. F. D. White ... | ,, 24, 25, 26 |
| Lockhart A. and P. Society ... ... ... ... | E. D. Arnold | ,, 31, and Sept. 1 |
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THE

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# Farmers' Experiment Plots.

## WHEAT AND OAT EXPERIMENTS, 1919.

## Riverina and South-western Slopes.

G. C. SPARKS, Acting Inspector of Agriculture.

THE 1919 series of wheat, oat and barley experiments in the Riverina were located as under :—

R. H. Thackeray, Woomack, Young.
H. M. Hall and Sons, Studbrook, Cunningar.
D. and J. Gagie, Spy Hill, West Wyalong.
Johns Bros. (R. B. Robb, manager), Wollongough, Ungarie.
G. H. Cox, Oakleigh, Ganmain.
M. J. Carew, Selbourne, Deniliquin.
H. W. Belling, Bexley, Lockhart.
Eulenstein Bros., Back Creek, Henty.
Jennings Bros., Urunga, Culcairn.
A McDonald, Bright View, Balldale.
T. E. Kendall, Mayburn, Ralvona.

Results are available from only nine centres, however, owing to the total destruction of the crops at Cunningar by a hailstorm of phenomenal severity, and to a total failure at West Wyalong consequent upon the droughty conditions prevailing there, coupled with the heavy nature of the soil upon which the plots were located.

### The Season.

Dry conditions prevailed throughout the summer of 1918–19. Except at Culcairn and Ralvona, the experiments were on fallow, but as in most cases the initial ploughing was done in September, 1918, the benefit of the August precipitation was very largely lost, and at the commencement of the sowing season the fallow held a very small reserve of moisture. Germination was, however, satisfactory on the whole, and good rain fell during May. The late winter and spring months were extremely dry, but the crops held out fairly well and the rain of early October assured a light harvest.

The experiments varied in size from thirteen to eighteen plots, each of $\frac{1}{4}$ acre, and included, besides the usual variety and manurial trials, trials of early *v.* late sowing, crop harrowing, graded *v.* ungraded seed, acclimatized *v.* unacclimatized seed, fallowing tests, rates of seeding tests, and also variety trials of oats and barleys.

Seeding was in some cases unavoidably later than it should have been, various influences co-operating to delay the operation—notably difficulties of soil preparation owing to the dry conditions prevailing, additional cultivation rendered necessary by weed infestation, and, lastly, the influenza epidemic.

As no new varieties were under trial during the past season, details regarding the varieties are unnecessary, but it is interesting to note that at three centres Hard Federation was the highest yielding variety, and it showed a slightly better average than Federation over the whole series. Warden was top yielder at Henty and Lockhart, but it seems unlikely that it will replace the standard varieties at Lockhart, it being rather a late maturer to be profitable there, particularly as a hay variety.

The germination of Canberra was very defective and its yield was materially reduced thereby, but, although subjected to the most trying conditions in common with other late sown varieties, it was the highest yielder at two centres.

RAINFALL during Fallow.

| | 1918. | | | | | 1919. | | | | Total. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | March. | April. | |
| | Pts. | Pts. | Pts. | Pts | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. |
| Young ... ... | 81 | 56 | 71 | 23 | 21 | 13 | 176 | 81 | 59 | 581 |
| Ungarie ... ... | 182 | 60 | 71 | 5 | 58 | 27 | 133 | 30 | 67 | 633 |
| Deniliquin ... | ... | ... | 83 | .. | 58 | 8 | 190 | 176 | 51 | 566 |
| Lockhart ... | 319 | 64 | 54 | ... | 27 | 11 | 118 | 45 | 90 | 728 |
| Henty ... ... | ... | 43 | 43 | 4 | 55 | ... | 71 | 65 | 106 | 387 |
| Balldale ... ... | ... | ... | ... | ... | ... | ... | 202 | 124 | 120 | ... |
| Culcairn ... ... | ... | . | ... | ... | ... | 1 | 97 | 151 | 175 | ... |

RAINFALL during Growing Period.

| | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Effective Rainfall. |
|---|---|---|---|---|---|---|---|---|---|
| | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. |
| Young ... ... | 283 | 72 | 53 | 149 | 135 | 60 | 9 | 369 | 469 |
| Ungarie ... ... | 280 | 20 | 15 | 57 | 54 | 50 | ... | ... | 495 |
| Deniliquin ... ... | 231 | 76 | 23 | 33 | 68 | 72 | 98 | ... | 477 |
| Lockhart ... ... | 163 | 90 | 62 | 72 | 60 | 102 | 46 | ... | 505 |
| Henty ... ... | 145 | 78 | 80 | 63 | 64 | 86 | ... | ... | 555 |
| Balldale ... ... | 117 | 92 | 39 | 115 | 84 | 51 | 159 | .. | 496 |
| Culcairn ... ... | 187 | 119 | 71 | 120 | 94 | 134 | 36 | 420 | 419 |

## Soil and Cultural Details.

*Young.*—Red loam soil. Ploughed August and September, 1918; harrowed, November; disced, middle of April, 1919; cross-harrowed, scarified, and harrowed at end of May. Late cultivation was rendered essential by thistle infestation. Sown 3rd and 4th June; 58 lb. seed, 56 lb. superphosphate. Harvested, 15th December.

*Ungarie.*—Red loam. Ploughed July, 1918; harrowed, 9th September and 20th March. Early sowing 15th April; 42 lb. seed, 56 lb. superphosphate. Late sowing 10th June; 55 lb. seed, 60 lb. superphosphate. Rainfall on late sowing, 188 points.

*Ganmain.*—Red loam. Ploughed August, 1918; spring-toothed November and March; harrowed before seeding. Sown 19th May; 56 lb. seed, 56 lb. superphosphate.

*Deniliquin.*—Grey loam. Ploughed 21st September, 1918; spring-toothed, 8th March, 1919; rolled, 9th April; spring-toothed, 13th May; harrowed and sown, 14th May; crop harrowed, 1st August; 55 lb. seed, 56 lb. superphosphate. Harvested, 6th December.

*Lockhart.*—Red loam. Ploughed in August, 1918; disced, February, 1919; harrowed and spring-toothed in April. Sown, 12th May; 55 lb. seed, 56 lb. superphosphate. Harvested, 3rd December.

RESULTS of Wheat Variety Trials.

| Variety. | Young. | Ungarie. | Ganmain. | Deniliquin. | Lockhart. | Henty. | Culcairn. | Balldale. | Ralvona. |
|---|---|---|---|---|---|---|---|---|---|
| | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. |
| Hard Federation .. .. .. | 12 56 | 2 48 | 6 32 | 8 32 | 9 12 | .. | failed. | .. | 7 52 |
| Federation .. .. .. | 9 48 | 4 53 | 5 11 | 5 57 | 6 49 | 11 19 | 5 52 | 5 49 | 5 21 |
| Marshall's No. 3 .. .. | 10 23 | .. | .. | .. | 9 23 | 8 23 | 4 37 | 7 1 | failed. |
| Warden .. .. .. | .. | .. | .. | 3 23 | 9 47 | 11 27 | failed. | .. | .. |
| Bomen .. .. .. .. | .. | 3 14 | 7 1 | 5 15 | 7 24 | 11 21 | 5 20 | 6 28 | 2 4 |
| Yandilla King .. .. | 8 29 | 2 17 | 6 44 | 2 3 | 8 16 | 10 48 | 6 39 | 6 51 | failed. |
| Major .. .. .. .. | 6 55 | .. | .. | 3 59 | 9 40 | 9 46 | failed. | 4 41 | failed. |
| Canberra .. .. .. | 8 5 | 2 13 | 7 18 | 3 20 | 5 4 | 3 39 | failed. | 7 36 | failed. |
| Improved Steinwedel .. | .. | 1 57 | 5 56 | 6 24 | .. | .. | .. | 6 53 | failed. |
| Bunyip.. .. .. .. | .. | 1 40 | .. | .. | .. | .. | .. | .. | .. |
| Golden Drop .. .. .. | .. | 1 39 | .. | .. | .. | .. | .. | .. | .. |
| Florence .. .. .. | .. | 1 9 | .. | .. | .. | .. | .. | .. | .. |
| Thew .. .. .. .. | .. | .. | .. | 2 48 | .. | .. | .. | .. | .. |
| Firbank .. .. .. | .. | .. | 5 6 | .. | .. | .. | . | .. | .. |
| Cleveland .. .. .. | 6 43 | .. | .. | .. | .. | .. | failed. | .. | .. |
| Currawa .. .. | .. | . | .. | .. | .. | .. | 5 20 | .. | .. |
| Zealand .. .. .. | .. | .. | 5 31 | .. | .. | .. | .. | .. | .. |

*Henty.*—Red loam. Ploughed early in September, 1918; spring-toothed November and in April, 1919. Early sowing, 22nd April; 45 lb. seed, 56 lb. superphosphate. Late sowing, 14th June; 60 lb. seed, 45 lb. superphosphate. Harvested, 2nd December.

*Culcairn.*—Red loam; stubble land. Ploughed early in May, 1919, and harrowed. Harrowed and sown, 7th June; 57 lb. seed, 60 lb. superphosphate.

*Balldale.*—Red loam. Ploughed August, 1918; harrowed in September; disced early in May and spring-toothed and harrowed three times; a heavy infestation of black oats rendered sustained cultivation necessary. Sown 5th June; 56 lb. seed, 56 lb. superphosphate. Harvested, 7th and 12th December.

*Ralvona.*—Grey loam, alluvial; stubble land. Ploughed end of April, 1919; harrowed twice; sown 12th June, 60 lb. seed, 60 lb. superphosphate. Harvested, 10th December. Rainfall not available, but conditions extremely

dry. The seed-bed was slightly moist and a little rough. Seeding was followed by a prolonged period of unusually severe frost, alternating with bright, warm days, which completely dried out the seed-bed and formed surface incrustation. A large amount of seed malted, and the residue of most varieties was apparently unable to penetrate the crust except in the shade of green timber, where germination was satisfactory in all varieties. The stand of all plots except Federation, Hard Federation and Bomen and of the oat plots was a total failure, and re-seeding was necessary.

### The Manurial Trials.

Manurial trials were carried through at seven centres. It might have been anticipated that in such a season the unmanured plots would have suffered severely, and it will be noticed that almost every application of manure brought about a substantial increase in yield, the ½ cwt. superphosphate giving an addition of 3 bushels 34 lb. on the average against the unmanured plot, or upwards of 101 per cent. The 70 lb. dressing of superphosphate, while a failure at Deniliquin and Lockhart, was the highest yielder at Young, Ganmain and Balldale. At Lockhart the lighter dressing of 42 lb. and no manuring failed, and crops were fed off.

Basic superphosphate was tried at Henty, and while giving an increase of 67 per cent. against the unmanured plot, did not compare at all favourably with superphosphate, being outyielded by the 56 lb. application by 3¼ bushels.

RESULTS of Wheat Manurial Trials.

| Manure per acre. | Young. | Ungarie. | Ganmain. | Deniliquin. | Lockhart. | Henty. | Balldale. | Average. |
|---|---|---|---|---|---|---|---|---|
| | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb | bus. lb. | bus. lb. |
| Superphosphate, 56 lb. .. .. | 9 48 | 4 53 | 5 11 | 5 57 | 6 49 | 11 19 | 5 49 | 7 5 |
| ,, 28 lb. .. .. | .. | 4 43 | .. | 5 46 | .. | 10 5 | .. | 6 51 |
| ,, 70 lb. .. .. | 10 8 | 3 25 | 7 1 | 2 57 | 3 56 | 10 36 | 8 9 | 6 36 |
| ,, 42 lb. .. .. | 8 12 | .. | 4 49 | 5 4 | failed. | 10 35 | 7 8 | 5 58 |
| Basic Superphosphate, 56 lb. .. | .. | .. | .. | .. | .. | 8 2 | .. | .. |
| No manure .. .. .. .. | 6 16 | 3 6 | 2 45 | 5 1 | failed | 4 47 | 2 47 | 3 31 |

Varieties used—at Balldale, Yandilla King; all other plots—Federation.

### Early v. Late Sowing.

Early *versus* late sown plots were included in the Ungarie and Henty experiments, the results being:—

*Henty.*

*Early sown* (22nd April, 1919)— *Late sown* (14th June, 1919)—
Bomen... ... 11 bus. 21 lb. Bomen ... ... 3 bus. 55 lb.
Federation ... 11 ,, 19 ,, Federation ... 3 ,, 3 ,,

*Ungarie.*

*Early sown* (15th April, 1919)— *Late sown* (10th June, 1919)—
Federation ... 4 bus. 53 lb. Federation ... 2 bus. 12 lb.

These figures indicate an advantage of 2½ bushels per acre upwards in favour of early sowing—a result that might have been anticipated, the season being particularly unfavourable to late sown crops.

### Crop-harrowing Experiment.

This was carried out at Deniliquin. Two plots of Federation were sown under precisely similar conditions on 14th May, one of which was harrowed on 1st August, the other being untouched. The yields were as follow:—

| | |
|---|---|
| Crop harrowed ... ... ... | 5 bus. 57 lb. |
| Crop not harrowed ... ... | 5 „ 36 „ |

Equivalent to an increase of 6 per cent.

### Graded v. Ungraded Seed.

These trials were located at Balldale and Lockhart, and both resulted substantially in favour of graded seed.

| | Balldale. | | Lockhart. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Graded ... ... ... | 5 | 49 | 6 | 49 |
| Ungraded ... ... ... | 5 | 15 | 6 | 0 |

Approximate increase, 12 per cent.

### Acclimatized v. Unacclimatized Seed.

At Deniliquin and Young plots of locally-grown Federation were included to compare with that supplied by this Department. In both cases, however, the local seed was from the 1918 plots. The figures are:—

| | Deniliquin. | | Young. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Local seed ... ... | 6 | 6 | 10 | 24 |
| Introduced seed ... | 5 | 57 | 9 | 48 |

Experience indicates that better results are likely to follow the use of acclimatized seed, other things being equal, especially in drier districts.

### Fallowing Experiments.

These were carried out at Ungarie, and included fallowed *versus* non-fallowed plots and also worked fallow *versus* unworked fallow. As the non-fallowed plot was not available until late in the season, this section of the experiment was seeded along with the late sown varieties, and was subjected to particularly unfavourable conditions. The worked *versus* unworked fallow plots were sown early. In any case the yields are only approximate, as the whole of the fallowing experiment was more or less damaged by sheep breaking through the fence. The yields were:—

| | |
|---|---|
| Fallowed (sown 10th June, 1919) ... ... | 2 bus. 12 lb. |
| Non-fallowed „ ... | 1 „ 40 „ |
| Worked fallow (sown 16th April, 1919) ... | 4 „ 53 „ |
| Unworked fallow „ ... | 3 „ 33 „ |

### Rate of Seeding.

These experiments were located at Ungarie and Balldale and were under different conditions.

The Ungarie plots were sown early (10th April), and in accordance with past experience they showed a substantial margin in favour of the medium rate of seeding.

| | |
|---|---|
| 45 lb. of seed per acre ... ... | 4 bus. 53 lb. |
| 60 lb. „ „ ... ... | 3 „ 50 |

At Balldale a late sown plot (5th June) seeded at the rate of 40 lb. per acre was included at the request of Mr. McDonald to test a local custom of light late-seeding, the results being:—

| | |
|---|---|
| 40 lb. seed per acre ... ... | 6 bus. 49 lb. |
| 55 lb. " " ... ... | 5 " 49 " |

It must be observed, however, that these yields were secured under decidedly abnormal conditions, and are therefore of little value. While a thin stand may be expected to be most effective under drought conditions, the practice of late seeding at materially increased rates is so firmly established that it does not admit of question.

### Oat Experiments.

Experiments with oats were included with the wheat experiments at Young, Ganmain and Ralvona under conditions identical with those mentioned above. The rate of seeding at Young was 51 lb. per acre, at Ganmain 43 lb., and at Ralvona 55 lb.

| Variety. | Young. | Ganmain. | Ralvona. |
|---|---|---|---|
| | bus. lb. | bus. lb. | bus. lb. |
| Algerian ... ... .. | 16 10 | ...... | 6 20 |
| Guyra ... ... ... | 17 1 | ...... | 5 7 |
| Lachlan ... ... ... | 18 25 | ...... | ...... |
| Ruakura ... ... ... | ..... | 8 35 | 11 7 |
| Sunrise ... ... ... | 17 23 | Cut for hay. | 12 15 |

At Ganmain the Sunrise plot "went down" before ripening and was cut for hay.

### Barley Experiments.

Trials were conducted at Young and Henty with the following results:—

| Variety. | Young. | Henty. |
|---|---|---|
| | bus. lb. | bus. lb. |
| Cowra 36 .. ... ... | 9 2 | ...... |
| Goldthorpe ... ... .. | 9 23 | 17 5 |
| Kinver ... ... .. | ...... | 20 11 |
| Pryor ... ... .. | ... .. | 19 40 |

At Henty the barleys (sown early and grown under identical conditions) compared most favourably with the wheat plots, the heaviest yielding wheat plot (Warden) making 11½ bushels, and the averages for barley being 19 bushels, and for wheat 10½ bushels.

At Young the seeding was a late one, and the barleys were outyielded by several of the wheat plots.

## Central-western District.

B. C. MEEK, Assistant Inspector of Agriculture.

### Grain Trials.

THE past season has been the worst yet experienced by the wheat growers in this district; consequently, results must be studied in their right perspective. As was to be expected in a dry season, the quick-maturing varieties generally did better than the long season ones. Canberra seed was badly bluestoned or it would have given better results.

Most of the plots received the bulk of their rainfall in the month after planting, and when the rain held off the plants withered away and looked like failure in August. The plots were eaten off by sheep at this stage, as it was considered the root systems would have a better chance of keeping the plants alive if they did not have too much top to support. At Gulgong and Coolah the plots were complete failures.

In oats, the wonderful success of the Departmental varieties at Lyndhurst deserves special attention, as in very few localities is anything but Algerian grown.

RESULTS of Grain Trials.

| | S. H. Robinson, Tallawang. | J. Montgomery, Coonabarabran. | H. J. Thompson, Canowindra. | J. Welsh, Mudgee. | A. R. Hall, Grenfell. | H. Leabeater, Lyndhurst. |
|---|---|---|---|---|---|---|
| Altitude .. .. | 1,640 feet. | 1,669 feet. | 984 feet. | 1,536 feet. | 760 feet. | 2,204 feet. |
| Average Rainfall .. | 25·84 inches. | 29·18 inches. | 22·58 inches. | 25·31 inches | 20·64 inches. | 26·68 inches. |
| Rainfall during growing period . | 6·30 inches. | 7·63 inches. | 7·54 inches. | 2·82 inches. | 2·57 inches. | 9·51 inches. |
| **Wheat.** | | | | | | |
| | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. |
| Hard Federation .. | 7 23 | 16 44 | 4 19 | 6 37 | * | .. .. |
| Canberra .. .. | 7 40 | .... | 2 40 | 6 48 | 1 38 | .. |
| Federation .. | 13 13 | .. | 3 19 | 5 8 | .... | .... |
| Yandilla King .. | 9 0 | .... | * | 5 4 | .... | .... |
| Florence .. .. | .... | 13 40 | .... | .... | 3 30 | .... |
| Marquis .. . | .... | 21 7 | .... | 3 44 | .... | .. |
| Major .. .. | 11 0 | .... | .... | .... | * | .. |
| Rymer .. .. | 12 19 | .... | .... | .... | * | .... |
| Warren . .. | 9 9 | .... | .... | .... | .... | .... |
| Bomen .. .. | 8 16 | .... | .... | .... | * | .. |
| Marshall's No. 3 .. | .... | .... | * | .... | .... | .... |
| Cleveland .. .. | .... | .... | * | .... | .... | .... |
| Currawa .. .. | .. | .... | .... | .... | * | .... |
| **Oats.** | | | | | | |
| Sunrise .. .. | .. | .... | .... | 9 1 | .... | 63 30 |
| Lachlan .. .. | .... | .... | .... | 7 10 | .... | 71 0 |
| Guyra . .. .. | .... | .... | .... | 6 22 | .... | 74 0 |
| Ruakura .. .. | .... | .... | .... | 8 24 | .... | 68 0 |
| Algerian .. .. | .... | .... | .... | .... | .... | 54 30 |

* Failure.

### Hay Trials.

Results were only obtained on the Central Tableland in the hay experiments the plot at Coonabarabran failing. Oats gave the heaviest yields, and the Department's varieties, Sunrise, Lachlan and Guyra, were ahead of all others.

The plots at Carcoar and Hobby's Yards were eaten off by sheep during August, and yet gave satisfactory results eventually. Patches of take-all and bunt were noticed in the wheat crops at Carcoar, and loose smut in White Tartarian oats at that place and Hobby's Yards; otherwise very little disease was present.

Rain came early at inopportune times on the tableland, but late rains just saved the situation.

RESULTS of Hay Trials.

| | W. Burns, Carcoar. | | | N. S. Meek, Hobby's Yards. | | | H. Leabeater, Lyndhurst. | | |
|---|---|---|---|---|---|---|---|---|---|
| Altitude ... ... ... | 2,673 feet. | | | 3,177 feet. | | | 2,204 feet. | | |
| Average Rainfall ... ... | 29·44 inches. | | | 30·15 inches. | | | 26·68 inches | | |
| Rainfall during growing period ... ... ... | 9·20 inches. | | | 10·11 inches. | | | 9·51 inches. | | |
| **Oats.** | | | | | | | | | |
| | t. | c. | q. | t. | c. | q. | t. | c. | q. |
| Sunrise ... ... ... | 1 | 4 | 0 | 1 | 16 | 0 | 2 | 0 | 0 |
| Guyra ... ... ... | 1 | 9 | 3 | 1 | 10 | 2 | 1 | 18 | 0 |
| Lachlan ... ... ... | 1 | 7 | 2 | 1 | 9 | 2 | 1 | 16 | 2 |
| Algerian ... ... ... | 1 | 6 | 2 | 1 | 12 | 2 | 1 | 10 | 1 |
| ,, (Farmers)... ... | 1 | 3 | 1 | ......... | | | ......... | | |
| Ruakura ... ... .. | 1 | 3 | 3 | 0 | 14 | 1 | 1 | 8 | 2 |
| White Tartarian ... ... | 1 | 0 | 0 | 0 | 10 | 3 | ......... | | |
| **Wheat.** | | | | | | | | | |
| Zealand ... ... ... | 1 | 7 | 1 | 1 | 3 | 2 | ......... | | |
| Florence ... ... ... | ......... | | | 1 | 0 | 0 | ......... | | |
| Marshall's No. 3 ... ... | 1 | 3 | 0 | 0 | 16 | 2 | ......... | | |
| Bomen ... ... ... | 1 | 1 | 0 | 0 | 18 | 3 | ......... | | |
| Cleveland ... ... ... | 0 | 16 | 2 | 0 | 17 | 2 | ......... | | |
| ,, (Farmers) ... | 1 | 0 | 2 | ......... | | | ......... | | |
| Marquis ... ... ... | 0 | 18 | 1 | 0 | 17 | 0 | ......... | | |

## Spring Wheat Trials.

Farmers in the colder districts are often delayed in their planting owing to wet weather, or to the previous crop (such as potatoes) not being ready to harvest before the usual planting time. Under such circumstances it would be far preferable to plant at the end of August or early in September than in July, when the soil is often beaten down and perhaps waterlogged. Planting late like this, good payable grain crops will be obtained instead of very inferior hay yields.

The grain in the varieties under trial was clean and plump, and compared more than favourably with early sown plots. Sunset was the first to mature, with Hard Federation next in order. Marquis and Cleveland (very late maturers) received the benefit at a critical stage of 131 points of rain more than varieties which had already ripened off.

RESULTS of Spring Wheat Trials.

| | N. S. Meek, Hobby's Yards. | J. S. Singer, Coonabarabran. |
|---|---|---|
| Altitude ... ... ... | 3,177 feet. | 1,669 feet. |
| Average Rainfall ... ... | 30·15 inches. | 29·18 inches. |
| Rainfall during growing period ... .. ... | 4·37 inches. | 1·28 inches. |
| | bus. lb. | bus. lb. |
| Firbank ... ... ... | 13 12 | * |
| Hard Federation ... ... | 12 19 | 1 30 |
| Clarendon ... ... ... | 10 59 | * |
| Florence ... ... ... | 9 30 | * |
| Sunset ... ... ... ... | 8 6 | 1 0 |
| Cleveland ... ... ... | 7 34 | * |
| Thew ... ... ... ... | 6 20 | * |
| Marquis ... ... ... | 5 38 | * |

* Failure.

## North-western District.

R. W. McDIARMID, Inspector of Agriculture.

THE wheat experiments conducted during the past year in the north-west were located on the properties of the undermentioned farmers:—

W. H. Lye, Loomberah, Tamworth.
J. T. Maunder, The Wilgas, Pallamallawa.
E. Bower, Hampton Valley, Warialda.
W. Palmer, Pine View, Narrabri.
J. Carroll, Oak View, Narrabri.
Jas. Cherry, The Willows, Wee Waa.
W. Lennox, Claremont, Baan Baa.
Y. C. Ormiston, Glenfenzie, Gunnedah.
J. Perry, senior, Killara, Quirindi.
Bignall Bros., Arlington, Manilla.

The experiments comprised variety trials, manurial trials, and a fallowing test. Unfortunately the season was very unfavourable, and no grain was harvested except at the three first-mentioned centres. The remaining districts produced nothing; and when it could be seen that a payable crop was impossible, the plots, like crops in general, had to be fed to starving stock. The plots harvested were also fed off early in the season, which proved, under the circumstances, a disadvantage.

### The Season.

The rainfall during the year was extremely low at each centre, and as the previous year was a dry one there was such a scarcity of moisture in the land as to make failure inevitable. The autumn was very unfavourable, and the

seed-bed could only be prepared with difficulty and not satisfactorily. The sowings were all late, and there was no opportunity of cleaning the land before performing the operation. A good year being expected after the 1918 drought, and the crops showing excessive growth, they were practically all fed off during the winter months. Good rains did not eventuate, however, and many of the crops never grew again. Crops not fed off yielded the best. The rainfall at the centres where some grain was harvested was as follows :—

| Locality. | April. | May. | June. | July. | August. | September. | October. | Total. |
|---|---|---|---|---|---|---|---|---|
| | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. |
| Tamworth ... | 87 | 211 | 65 | 50 | 97 | 66 | 217 | 792 |
| Pallamallawa | 46 | 351 | ... | 37 | 65 | 10 | 101 | 610 |
| Warialda ... | ... | 350 | 22 | 30 | 52 | 9 | 121 | 584 |

The May rainfall was utilised for preparing the seed-bed, and the October rainfall was too late to benefit the crops very much. In ordinary seasons the October rainfall would have benefited the crops considerably, but they matured very rapidly during the spring and winter months, and the early varieties were within a few days of stripping when the October fall occurred. Late varieties which were not too near maturity did benefit considerably by the October falls.

### Results at Various Centres

*Tamworth.*—The following table shows the yields obtained at Tamworth, where the plots included long and short fallowed land and land prepared only with the spring-tooth cultivator.

RESULTS of Variety Trials at Tamworth.

| Long *v.* Short Fallow. | | | | Preparation with Spring-tooth Cultivator. | | |
|---|---|---|---|---|---|---|
| Bushel Weights by Chondrometer. | Variety. | Long Fallow. | Short Fallow. | Bushel Weights by Chondrometer. | Variety. | Yield. |
| lb. | | bus. lb. | bus. lb. | lb. | | bus. lb. |
| 62½ | Marshall's No. 3 .. | 8 36 | 4 25 | 62 | Currawa .. .. | 9 29 |
| 62½ | Yandilla King.. .. | 11 6 | 5 0 | 57 | Bomen.. .. .. | 10 2 |
| 58½ | Cleveland .. .. | 12 50 | 3 25 | 60½ | Federation .. .. | 10 45 |
| 61 | Marquis.. .. .. | 12 0 | 3 43 | 62 | Cowra No. 15 .. | 10 43 |
| 63 | Clarendon .. .. | 14 0 | 3 6 | 60 | Comeback .. .. | 8 8 |
| 63½ | Hard Federation .. | 14 0 | 2 45 | 58 | Cumberland.. .. | 9 0 |
| 64 | Rattling Jack .. .. | 12 4 | 6 32 | 56 | Huron .. .. | 3 42 |
| 59 | Rymer .. .. .. | 12 24 | 6 10 | 56½ | Avoca . .. .. | 9 6 |
| 61½ | Zealand .. .. .. | 11 2 | 4 55 | 57 | Thew .. .. .. | 6 53 |
| 58 | Penny .. .. .. | 7 20 | 3 45 | 59½ | Cedar.. .. .. | 7 52 |
| 64 | Canberra .. .. | 15 40 | 7 22 | 56½ | Huguenot .. .. | 5 4 |
| 62½ | Florence .. .. | 12 28 | 5 24 | 57 | Medeah .. .. | 6 24 |
| 60½ | Sunset .. .. .. | 13 20 | 4 20 | | | |
| 61 | Bunyip .. .. .. | 11 15 | 4 45 | | | |
| 62 | Pusa No. 4 .. .. | 12 0 | 4 20 | | | |
| 60 | American No. 8 .. | 16 24 | 3 44 | | | |
| 61 | Red Wings .. .. | 15 0 | 5 50 | | | |
| 62 | Currawa .. .. | 11 20 | 4 25 | | | |

The varieties were sown in their respective seasons, the slow-growing varieties being sown in May and the quick-growing ones on 1st July. All

plots were fed off heavily with sheep late in July and early in August, after which they were harrowed. The preparation of the land in the case of the long fallow consisted of a ploughing in September, cultivation with spring-tooth in November, and sowing to maize, which failed to germinate. The short fallow section was ploughed in December and harrowed down in March. Both sections were spring-tooth cultivated in April and sown May–July.

In order to test a cultivation method that is occasionally practised, certain land which had been sown in May of the previous year and the crop on which had been fed off with sheep, was prepared for a second crop by working with the spring-tooth cultivator in May, 1919, and again in June after the good May rains. Sowing took place on the 5th and 12th June on an ideal seed-bed.

The sections that were treated differently soon showed marked differences, more so than in normal years. In some instances the variation in yield was as much as 50 per cent. in favour of properly long-fallowed land.

The good results obtained from the use of the spring-tooth cultivator on the non-fallowed land demonstrate the value of that implement for quick and cheap methods, and agree with those of previous years in the Quirindi district. The comparative increase over the December-ploughed land is due to the better seed-bed produced. The December-ploughed land was ploughed dry and turned up rough, and it never compacted properly.

The samples of grain were mostly good ones. The bushel weight of each variety is shown, the best being Canberra and Rattling Jack, with Huron at the bottom.

RESULTS of Manurial Trial at Tamworth.

Variety—Canberra.

| Manure per acre. | Long Fallow. | Short Fallow. |
|---|---|---|
| | bus. lb. | bus. lb. |
| Nil ... ... ... ... | 15 40 | 7 22 |
| 25 lb. Superphosphate ... | 15 2 | 7 45 |
| 50 ,, ,, ... | 15 26 | 7 50 |

*Warialda.*—The varieties grown at Warialda, with their respective yields, are as follow :—

RESULTS of Variety Trials at Warialda.

| Variety. | Yield. | Variety. | Yield. |
|---|---|---|---|
| | bus. lb. | | bus. lb. |
| Bunyip ... .. | 6 1 | Federation ... ... | 2 24 |
| Canberra ... ... | 5 7 | Bomen .. ... | 1 35 |
| Steinwedel ... ... | 4 15 | Rymer ... ... | 1 12 |
| Sunset... ... ... | 2 46 | Marshall's No. 3 ... | 0 52 |
| Hard Federation ... | 3 54 | Currawa ... ... | eaten out. |

The land at Warialda was prepared with the spring-tooth cultivator in February, and again in May for the late sown varieties. The late wheats were sown on 20th May, and the quick growers on 12th June. The final figures were very much reduced by an unusually heavy visitation of parrots.

***Pallamallawa.***—The early maturing varieties here would have returned up to four bags per acre had not the parrots caused so much damage. The wheat had to be harvested before being properly matured to get any grain at all. Sunset, Florence, Bunyip and Canberra proved the best, and about two bags per acre were harvested from each. The rainfall here was extremely low, and Sunset matured a fair crop on 112 points of rain from the date of sowing. It was sown on 10th June and harvested early in October. All the varieties were fed off with sheep, for they made very rapid growth in June and promised well. They would have yielded fair returns had this been omitted. The land was ploughed for the plots early in January and disc-cultivated early in May. Sowing took place on 8th May with all varieties, excepting Sunset.

All the other plots sown were fed to starving stock when it was seen the prospects were hopeless.

### Conclusions.

Valuable conclusions can be drawn from the results from those plots harvested, and especially those in the Tamworth district. In every instance where it was adopted, the working of the land after the rain gave growth and returns superior to that worked only prior to the rain and while the land was dry. The value of a properly compacted seed-bed was again very plainly demonstrated in the long and short fallowing plots at Tamworth, and the May preparation with the spring-toothed cultivator only. The use of superphosphate with a quick maturing variety on the long and short fallowed land is unnecessary.

The good yields on the long fallow at Tamworth plainly demonstrate the value of that system in the north-west, and should be sufficient to induce more farmers to adopt it. The results at Tamworth explain why good crops can be, and were, grown side by side with failures under the same rainfall. When farmers appreciate the reason more fully, and adopt more thorough methods, superior yields will be harvested, and the idea that some farmers are "very lucky" will be exploded.

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Possibly others besides a recent Port Macquarie correspondent have meditated the possibilities of a large galvanized-iron tank for the making of silage. The capacity of that of the correspondent was 1,000 gallons, and the crops to be ensiled Sudan grass, saccaline sorghum and broom millet.

The tank mentioned would be quite useless for making silage, as crops cannot be ensiled satisfactorily unless in fairly large quantities—say from 70 to 100 tons. Under such circumstances, we would advise cutting the crop and endeavouring to cure it for hay.—A. H. E. McDonald, Chief Inspector of Agriculture.

# A Note on the Over-summering of Wheat Rust in Australia.

W. L. WATERHOUSE, B.Sc. (Agr.),
Walter and Eliza Hall Agriculture Research Fellow, University of Sydney.

THE question how rust of wheat survives through the hot Australian summer and successfully infects the next year's crop is of the utmost importance, and the answer should be found if the disease is to be satisfactorily dealt with. Various solutions of the problem have been offered. In his "Rusts of Australia," p. 69, McAlpine suggests that the self-sown or "volunteer" wheat growing in the paddocks or on headlands may be responsible rather than the black oats and other grasses.

In the course of some work at Sydney University dealing with the rust problem an effort was made to secure evidence bearing on the point. Thanks to the courtesy of Mr. G. Valder, Under Secretary for Agriculture, and his officers, visits were paid to certain of the Government experiment farms where wheat is an important crop, and from time to time observations were made in the field. The period that was covered extended from June, 1918, till March, 1919. The summer of 1918–1919 was one of the driest recorded in the parts visited; drought conditions were general and no rust epidemic was reported anywhere in the State.

It should be remembered that the destructive rust of the wheat crop in Australia is the Summer Rust or Black Stem Rust (*Puccinia graminis*). A second form, known as the Spring Rust (*Puccinia triticina*), occurs, but it is usually stated that this does little damage. The Yellow Stripe Rust (*Puccinia glumarum*), which does so much harm in Europe, has not yet been reported from Australia.

In June, 1918, abundance of self-sown (from shed grain) and second-growth wheat was found in heavily stocked stubble paddocks, growing in the shelter of thistles and other coarse plants, in crops of rape, on headlands under fences, and more especially round haystacks. It was also present in quantity along some of the railway tracks. On the leaves, stems and ears of this volunteer wheat a large amount of summer rust in the uredo and teleuto stage was found, as well as the uredo stage of the spring rust. Uredospores were tested and proved viable. At this time the growing crop was about 6 inches high, and in many places was only a few yards away from the badly-infected volunteer wheat. On this sown crop, however, no sign of summer rust was discovered, although pustules of the spring rust were plentiful on the seedling leaves.

At the end of August, 1918, a similar state of affairs prevailed. Rusty volunteer wheat was plentiful, but on the leaves of the sown crops, now 15 to 18 inches high, only uredo pustules of spring rust were found. One paddock that had previously been observed to carry much rusty volunteer wheat had been ploughed, but growing up between the furrow slices were many of the wheat plants with both forms of rust on them.

Towards the end of November, when the harvest was in progress, these districts were again visited. On the green parts of plants in the crop, viable uredospores of both rusts were found, though practically no damage had been done to the crop. Volunteer wheat, particularly round haystacks, was red with summer rust on all above-ground parts of the plants. The field noted as having been ploughed had been reploughed and cultivated, but straggling volunteer wheat plants carrying viable uredospores of both rusts were still to be found.

It was not until the end of March, 1919, that the next inspection was made. The summer had been exceptionally dry and very hot; no second growth had occurred, the stubble having been killed out by the dry weather in most places. A light rain in February had germinated much of the shed grain, but on these seedlings no rust was discovered. Only in one place was rusted wheat found; this was in a paddock which had been fallow for nearly a year, ploughed a couple of months previously, and at the time of the visit was being cross-ploughed and harrowed in preparation of a seed-bed for wheat. Here, in the centre of several much-grazed tufts of wheat that had assumed a somewhat perennial nature, were found uredo pustules on leaves, inner surface of sheaths and stems. In the cases examined the rust proved to be the spring rust, but it is by no means impossible for the summer rust to have also been present in some of the tufts. In an adjoining paddock the early sown crop of wheat was through the ground, but no rust pustules were found in it. Numerous pale patches were observed on many of the seedling leaves.

While these observations are far from complete, they do go to show the importance of volunteer wheat as an agency for the spread of rust by means of the uredospores. It is hoped that other observers will pay attention to this matter in order to try and complete a chain of evidence.

## A Home-made Rain Gauge.

A HOME-MADE rain gauge can be made of a kerosene or any straight-sided tin, the open end being carefully cut in order that the aperture may retain the shape of the bottom of the tin and the sides remain unbulged. This should be set in a cleared spot on a flat surface. To ascertain the amount of rain that has fallen, it is only necessary to use the ordinary rule. An eighth of an inch represents about 12½ points; ¼-inch 25 points; and so on. This is not strictly accurate, but sufficiently so for farmers' purposes.—A. H. E. McDonald, Chief Inspector of Agriculture.

# Field Peas as Fodder.

## A Substitute for Wheat and Oats.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

With the present extreme scarcity of suitable varieties of seed wheat and oats in New South Wales, many farmers will naturally look for some substitute fodder crop. The claims of field peas as an efficient crop for the purpose might well be taken account of just now.

Field peas have been for many years the most popular crop with orchardists in many districts (especially in citrus orchards) as a green manure and cover crop. On maize land on the coast which has been continuously cropped for many years and which is showing signs of "wearing out" (indicated by deficiency in humus and poor physical condition), field peas are being increasingly used as a means of restoring the land to its former tilth. On the Macleay River they are being more and more extensively sown for the combined purposes of soil improvement and stock feeding. The seed is usually sown after the early maize crop is off in February, March or April, and the growth is generally fed off by dairy cows during July or August, when there is a shortage of winter feed. Farther north on the coast, where maize is sown later, the best farmers are sowing field peas among the maize at the last cultivation (usually during February), and they find the legume not only improves the soil but provides a substantial bulk of nutritious feed for dairy cows when turned on to the cornstalks after the maize is harvested. The system is usually highly successful because of the good autumn rainfall on the upper North Coast and the frequent dry winter and spring months, which favour late plantings of maize and also make feed of the kind scarce in winter and spring.

On the Northern Tableland and in the wheat districts where there is a good winter rainfall (such as the Riverina and Central-western Slopes) field peas are coming to the front as a fodder crop for sheep; and though they have not yet entered into the regular rotation to any extent in those districts, their value in this direction has been partially proved by experiments. In South Australia and Victoria the use of field peas in the rotation has been definitely established, and has taken its place in an improved system of mixed farming. In these cases field peas are used alone, and where wheat and oats are unprocurable for seed this season, farmers in those wheat districts that have been mentioned might well consider the advisability of sowing this substitute on at least part of their land. The result will, perhaps, lead them to realise its advantages as a fodder crop and for soil improvement.

Mr. H. Ross, Manager of Wagga Experiment Farm, supplies the following figures for wheat after various fodder crops at that farm :—

| Previous Crop. | Yield of Wheat. | | | | | |
|---|---|---|---|---|---|---|
| | 1915. | 1916. | 1917. | 1918. | 1919. | Average 5 years. |
| | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. |
| Rape ... ... | 14 47 | 8 27 | 16 7 | 3 30 | 4 46 | 9 32 |
| Peas ... ... | 15 53 | 16 0 | 20 40 | 9 0 | 10 7 | 14 20 |
| Barley.. ... | 14 38 | 13 11 | 17 6 | 6 7 | 8 50 | 11 58 |
| Vetches ... | 15 35 | 15 19 | 17 47 | 8 23 | 6 47 | 12 46 |

In other cases where wheat and oats are used exclusively for winter fodder on the coast and tablelands, and for hay for farm use in some of the wheat districts, there is room for the inclusion of field peas in cultivation with these cereals to the extent of saving at least a quarter or a half of the cereal seed, and at the same time securing a heavier growth of better balanced and more nutritious fodder or hay.

On many parts of the coast and tablelands there are numerous soils not naturally fertile which are being cropped with summer and winter fodders alternately without any legumes—a system which must inevitably lead to soil exhaustion very quickly, and render the profitable growth of such crops absolutely dependent on a good rainfall and the use of increasing quantities of fertilisers. The present shortage of wheat and oats will really be a boon to these farmers if they will replace the cereals wholly or in part by field peas and utilise the growth for feeding off as much as possible.

## Varieties.

Very few varieties of field peas have been tested in New South Wales; and there is room for improvement on the varieties known here, according to the use made of the crop—whether for green fodder, hay, or green manuring —in different districts. By the courtesy of the United States Department of Agriculture, over fifty varieties are now under trial on the experiment farms in this State, and the Department here hopes to establish the best in the most suitable localities. There is a wide difference in fodder-producing capacity and also in time of maturity; and varieties will be found to suit the maturity of different wheats and oats which are grown for green fodder, so that the peas can be used in combination with the cereal—both reaching the right stage for fodder together. It seems as if the varieties with small seeds will be the most desirable, provided they produce the growth of fodder, because they considerably cheapen the cost of seeding—less seed being required of them to sow an acre. Several of the new varieties are more promising in this respect than the kinds we already know.

The chief varieties recently tried in New South Wales are Grey, Blue, Canada, and Egyptian or Dun. These may be considered to be broad classifications based on colour of seed more than anything else. Grey and Blue are practically the only ones obtainable from seedsmen.

The Grey field pea is a late variety, with fairly large grey seeds mottled with brown. It matures with Huguenot wheat and with Algerian oats, and is the favourite variety for green fodder or green manuring on the coast. It produces more forage than the Blue variety, and is also usually quoted at about half the price of the latter, being at present at about 10s. per bushel.

The Blue variety is earlier and not such a good fodder sort, but matures with earlier grains like Thew wheat or Sunrise oats.

The Canada variety is a small white-seeded kind which matures about the same period as the Blue, and is a heavier yielder of fodder. Egyptian or Dun is a large dun-coloured seed, producing a good growth of fodder and is slightly earlier than Grey.

### Sowing.

The best results have been obtained from sowing sufficiently early in autumn to get a good growth before winter. During very cold weather in the colder districts little growth is made, but although the crop remains practically stationary (except in the warmer climates) it resumes growth in early spring. As a fodder crop it does not seem to have been very successful if the sowing is delayed till spring. In the warmer districts such as the coast it makes good growth as a rule if sown during April or May, whereas in the tablelands districts it should either be sown in February or March, or left till early spring. High temperatures and frost are both injurious to field peas, not so much in the younger stage as at the flowering and early podding stages.

The rate of seeding depends on the size of the seed and the fertility of the soil. For broadcasting on moderately fertile soil, from 1½ to 2½ bushels are required—the smaller quantity being used with a small seeded variety. On fertile alluvial soil these amounts may be reduced by half a bushel, while if sown in the growing maize crop, or with a combination crop like wheat or oats, from ½ to 1 bushel only will be necessary—the amount of grain being reduced accordingly. If sown in drills these quantities may be still further reduced.

Peas may be sown fairly deeply compared with most other seeds (except on heavy clay soils), even ploughing in 4 or 5 inches deep on sandy loams or light soils—following with a shallow drilling or broadcasting of the cereal if used in combination.

No fertiliser has given such good results with peas as superphosphate alone—from ½ to 1 cwt. being recommended, the smaller quantity in the drier districts, and the larger amount on the coast. There is every reason to believe that better yields of maize and summer crops on the coast will follow from fertilising the pea crop than from directly manuring these crops.

### Harvesting, Utilisation and Yields.

Field peas sown alone are seldom harvested for hay in this State, partly owing to the somewhat greater difficulty in curing the crops, but probably more because of the trouble experienced in mowing such a tangled mass of fodder with the ordinary mower. Many of the machinery firms in Sydney,

however, now stock a pea harvesting attachment, consisting of guards which protrude forward from the cutter bar of the mower, and lift the vines from the ground, enabling the mower to pass underneath without obstruction.

Peas are quite a suitable crop for grazing off with cattle, pigs or sheep. The best way to avoid loss by trampling and spoilage is to stock heavily on a small area at a time, using temporary fencing. They have the disadvantage of not being able to "come again" after grazing like rape, but this defect is overcome by making successive sowings and grazing as suggested. The yields obtained from the subsequent wheat crops at Wagga show that field peas cannot be ignored in the rotation in similar districts.

From the yields obtained there is little doubt of the advantages of the substitution (either in part or wholly) of field peas for green fodder on the coast. Experiments during the last five or six years on farmers' experiment plots have shown that with this substitution the yield from the combination crop or from field peas alone may be relied on to average from 2 to 3 tons more green fodder than from the best wheat or oats.

It is not intended to deprecate the praiseworthy efforts of those who have grown good cereal winter fodders on good land, but to show that there is room for still further improvement by the inclusion of field peas as one of the farm crops.

## Japanese Buckwheat as a Honey Producer.

Replying to an inquiry as to the virtue of Japanese buckwheat as a honey-producer, the Senior Apiary Inspector wrote: "When flowering, Japanese buckwheat is valuable for bees, but at the present time it is not extensively grown in New South Wales. I do not consider that much benefit would be derived from individual apiarists growing the buckwheat for stimulating the bees in dry seasons, but if farmers could be induced to grow it as a profitable crop as well, a good deal would be done for bee-keeping. This buckwheat is grown fairly extensively in America, where its cultivation has been found profitable by both the farmer and the apiarist. It is a fairly sure honey producer every season, and an endeavour will be made to encourage its introduction into our own bee-keeping localities."

## Immature Sudan Grass is Harmless to Stock.

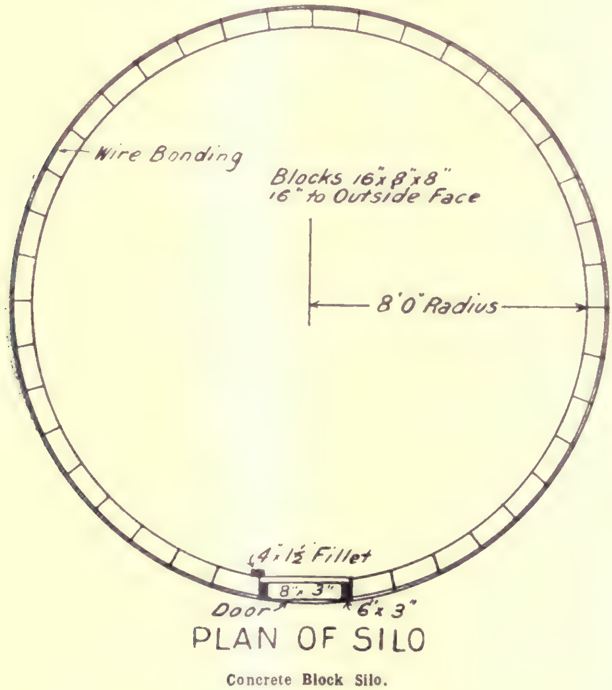
"I have sown Sudan grass, Feterita and Hungarian millet, but they have germinated poorly and are at present wilting for want of rain. Do any of them generate poison or is it safe to turn the stock on to them?"

The foregoing inquiry, which reached the Department recently from a Trundle correspondent, was replied to by the Chief Inspector of Agriculture as follows:—"We have known stock to be fed on immature Sudan grass and Hungarian millet in a large number of cases, and no cases of poisoning have occurred. The Department has not heard of poisoning occurring through stock eating Feterita sorghum, but cases have been reported in America, and we therefore consider there would be some risk in allowing horses to feed on it."

# The Construction of a Concrete Block Silo.

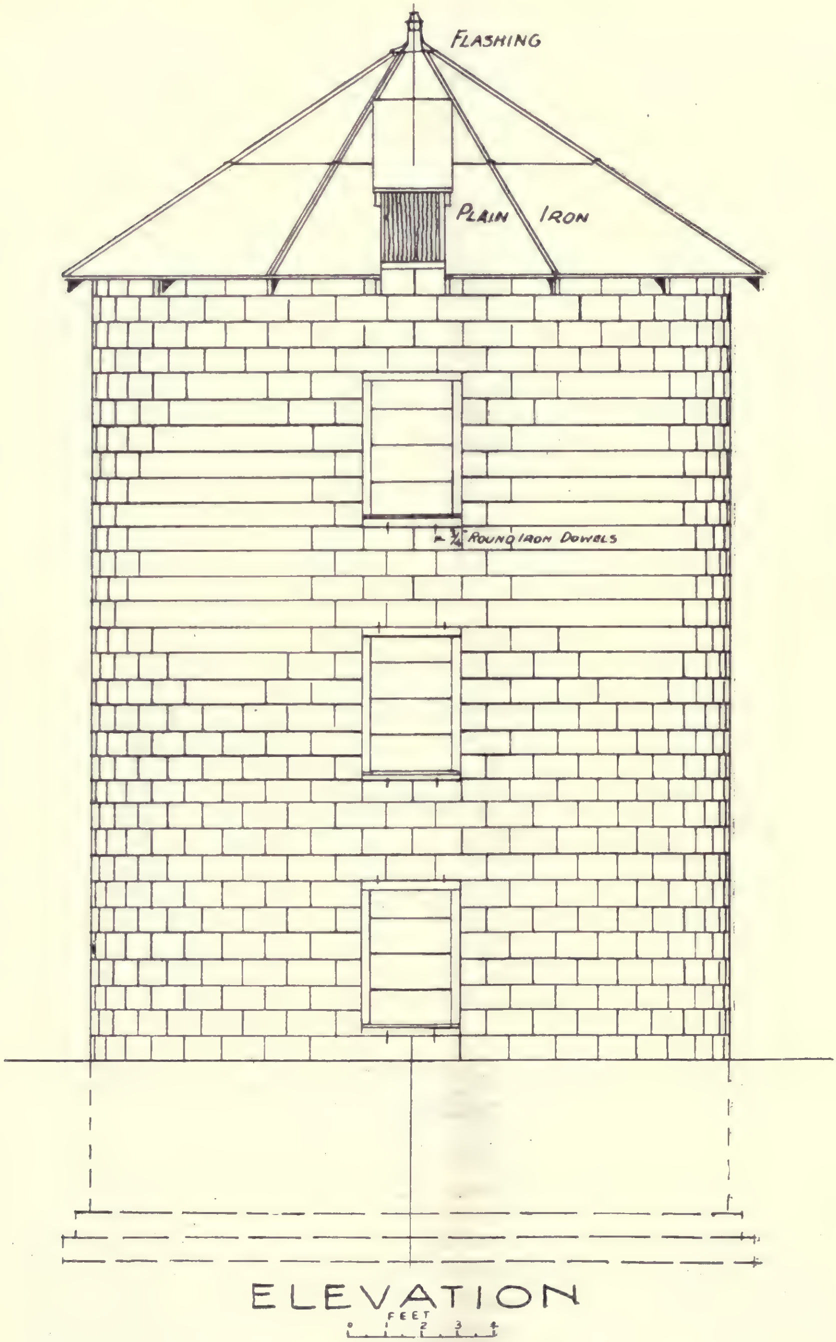
A. BROOKS, Works Overseer.

THERE are several classes of material that can be used for the construction of overground silos; they are principally stone, brick, wood, or concrete. Each of these has its own recommendations, and the choice depends in a considerable degree on which is the nearest to the farm, and its cost compared with the others. In the opinion of a good many farmers the wood silo turns out the best silage, and concrete the next best, but the point is not one about which there is entire unanimity. Both stone and brick—unless plastered with cement mortar—absorb a good deal of the moisture in the vegetable material ensiled, and the "cure" is, therefore, not so satisfactory nor the fodder so palatable when ultimately fed to stock.

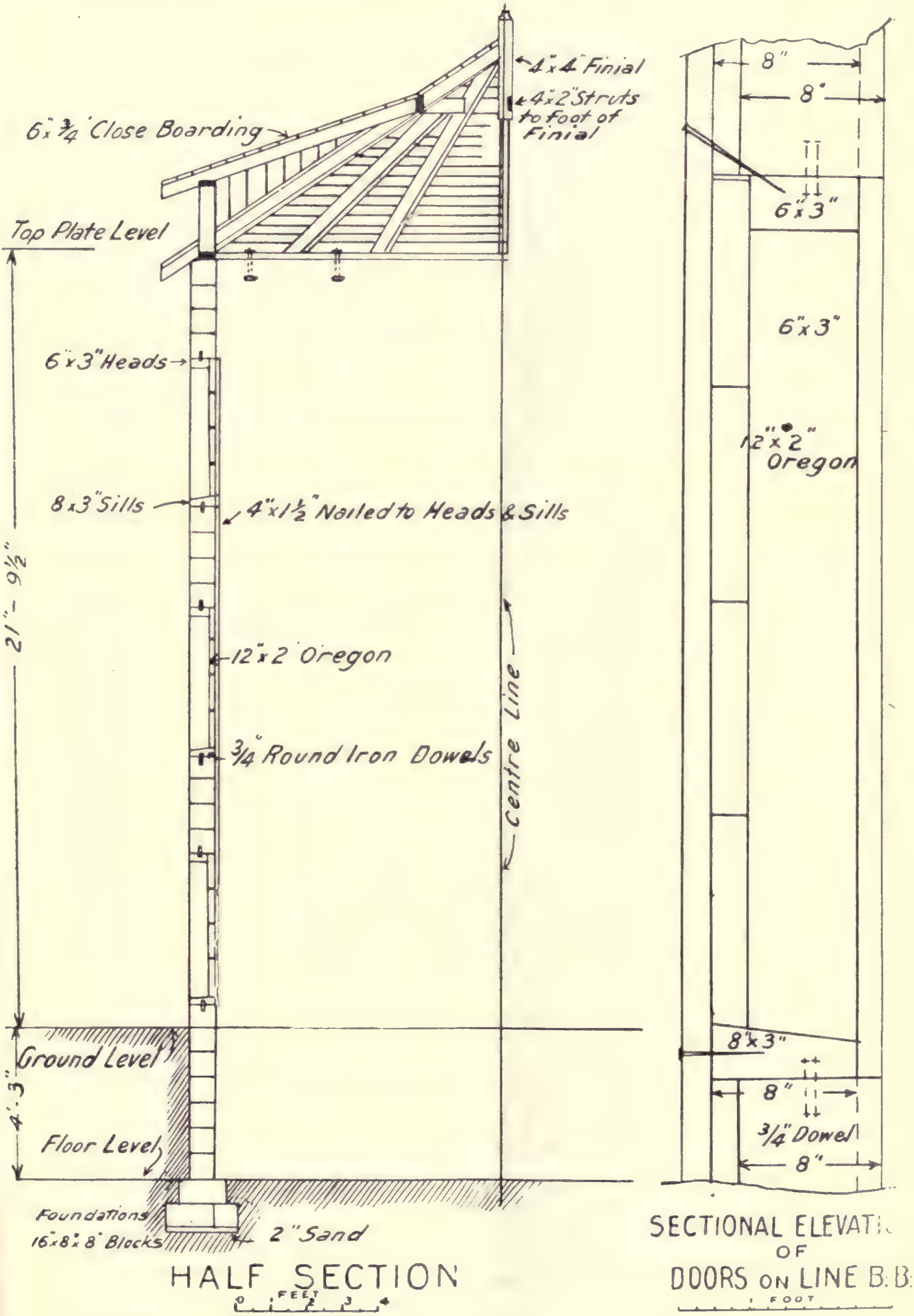



Concrete Block Silo.

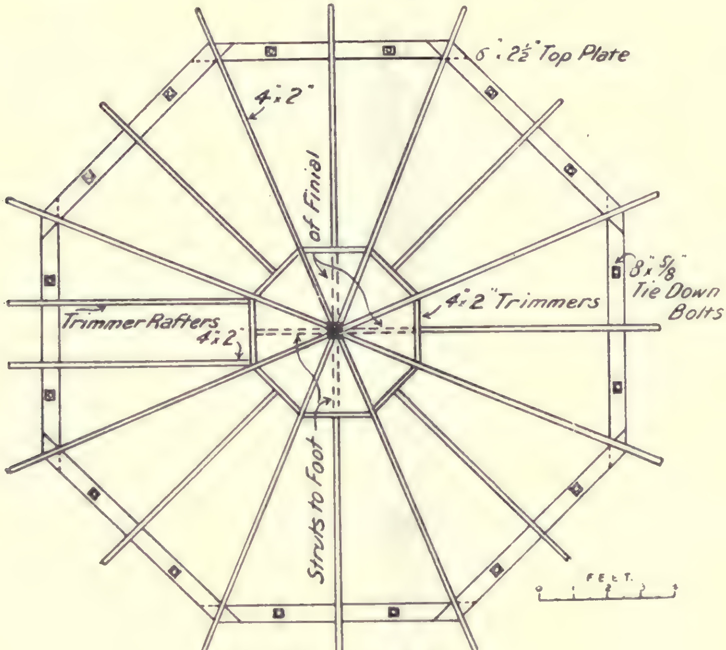
The cheapest form of concrete silo is that built of concrete blocks or large concrete bricks. These are most expeditiously made with a block-making machine, but a home-made mould may be constructed with wood and plain iron, which, though slower in turning out the blocks or bricks, will be found quite satisfactory, especially to the farmer who makes up his mind to make



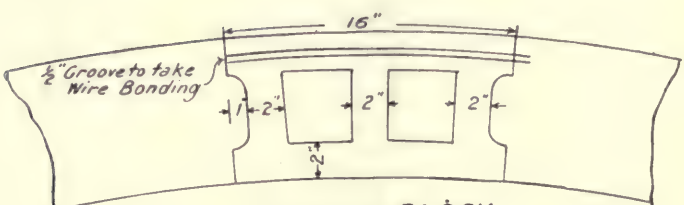

Concrete Block Silo.



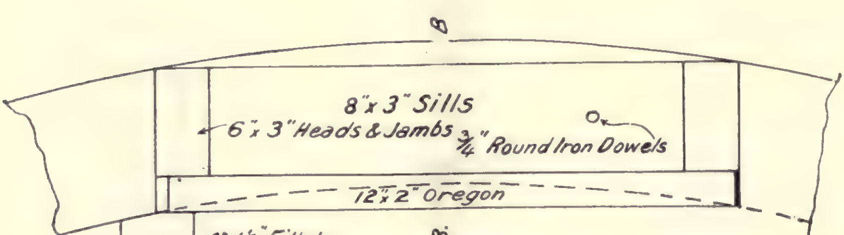

Concrete Block Silo.




ROOF PLAN




PLAN OF BLOCK




PLAN OF DOORS

1 FOOT

**Concrete Block Silo.**

the blocks a few at a time on otherwise slack days. Working quietly on these lines, it is possible for a farmer to collect, at a minimum of expense, the necessary material for a structure that will be a valuable asset on his farm, and a cheap insurance against periods of scarcity.

The machine for making the blocks at present costs £60 at least, but with a man and a boy, a hundred blocks can be turned out in a day. The best type of machine is that which turns out the block face downwards; this allows for a better class of material being used on the face for weathering purposes. With a home-made mould not more than twenty blocks per day can be finished.

The shape of the block referred to is shown on page 174 (plan of block), and the mould may be simply a four-sided box, with the necessary cores to form the two holes. These holes in the blocks not only economise in concrete material, but form a cavity in the walls, which acts as an insulation.

SPECIFICATION.

*Concrete Block Silo.* Height 25 feet, diameter 16 feet.

*Material.*—The mixture used may be sand and cement for the face (3 of sand to 1 of cement) tamped into a mould about ¾ inch thick; for the remainder, 5 of gravel and sand to 1 of cement. About sixty to sixty-seven blocks are made from a cubic yard, and 1,676 blocks, including eighteen halves, are required to build a silo.

This allows for footings, which may be of blocks laid as shown in section; or the lower course may be of concrete, laid in the trench 24 inches by 8 inches deep, in which case 1,553 blocks will be sufficient.

*Excavation.*—The lower 4 feet 3 inches of the silo is set into the ground; this reduces the labour of elevating when filling and strengthens the silo. If the ground is firm, such as hard clay, no other floor requires to be provided, but if it is soft, a concrete floor about 6 inches thick should be put in. No drainage from the floor is necessary.

*Walls.*—On the footings, set the blocks in cement mortar, gauged 3 to 1, and with ⅜ inch thick joists.

At 3 feet from the floor and to each course upwards, bed at 1 inch from the outer face, either a ⅜ inch round iron rod or two strands of No. 8 fencing wire twisted together.

A groove should be made in the top bed of the blocks to receive this, but if wire is used and it is carefully set, it may be laid in the bed-joint mortar. The outer face joints are struck jointed, and the inner face pointed up, and the whole of the inner face of the silo is bagged over with cement wash.

*Doors.*—The first door frame is set on at 9 inches over the ground line, and spaced as shown. Frames are made of sawn hardwood, the sills 8 inches by 3 inches weathered, and the remainder 6 inches by 3 inches, square, and each fitted with two ⅜ inch iron dowels top and bottom. The dowels are set about 4 inches into the cement blocks, which are made solid for the purpose of receiving them. Over the inner face of the frames, and on one side of the openings, is fixed a vertical hardwood batten to form a groove to take the ends of the door planks. This serves to hold the latter in position when the silo is empty. The door planks are of dressed 12 inches by 2 inches oregon, jointed at the edges, and when set into the frames they are covered over at the inner face with 2-ply roofing material, extending about 6 inches beyond the frame to better exclude the air.

*Roof.*—The top plates are formed into an octagon and secured at the top course of blocks by means of ½ inch bolts, bedded into the blocks, and a roof is built as indicated on the plan, boarded and covered with either plain galvanized iron, or flexible roofing material with 1½ inch rolls in the angles. Guttering is unnecessary on the eaves, unless the water is required. A dormer opening is formed, as shown, for entrance of the head of the elevator or blower. No door is required on this.

A cheaper roof of open gable ends may be substituted for that on the plan; it serves equally well, but does not look so well.

## Effects of a Crop Competition in Victoria.

Extract from the report of the judge (Mr. A. H. Mullet, B.Ag.Sc., Chief Field Officer, Victorian Department of Agriculture) on the Nhill Crop and Fallow Competition, 1919 :—

"Except for a break of one year during the 1914 drought, this competition has been held annually for twenty successive years, and it now ranks as one of the established agricultural institutions of the State. The benefits that have been conferred by it locally are widely recognised, and the view is generally accepted that such competitions are most valuable in encouraging the spread of the best farming practices. . . . .

"At Nhill the competition has developed much further than a mere contest for a prize. It takes the form of an annual public investigation on the spot into the methods by which the best crops of the year in the district have been grown. It even goes further than that. Prior to the war, in one section of the competition the whole of the farm—home, garden, buildings and their arrangement, subdivision, fencing, water supply, plant and implements, horses, sheep and cattle—were judged as well. The effect has been most noteworthy, and to-day on the average there is no district in the wheat belt where the farms are so well improved or better managed than at Nhill."

## Wheat on Heavy Black Soil.

"I have a 140-acre paddock of very heavy black and chocolate soil. Wheat has failed on it three out of five years, and I am advised to plant oats. I want to plough and sow early, and I think oats can be sown earlier than wheat. What can you advise ? What about broadcasting and ploughing in ?"

Replying to this question from the Merrygoen district, the Chief Inspector of Agriculture recently wrote as follows :—"Crops are only grown successfully on this class of land when the rainfall is fairly favourable. From the results which we have obtained from similar soil, we consider that wheat is just as likely to succeed as oats—as a matter of fact, some of the early wheats give a better return than oats, as they reach maturity at an earlier stage, and are not affected by drought to the same extent.

"With this class of land, broadcasting the seed gives excellent results, and is apparently quite as good as drilling the seed in. We recommend early planting, say about April, as the crop then comes to maturity before the hot weather of the following spring, which is a most critical time with crops when grown on black soil."

## "Cheap" Banana Suckers are Sometimes Costly.

It is pointed out by the Assistant Fruit Expert stationed at Murwillumbah, that in the cultivation of bananas much depends upon the selection of the young suckers. He lays great stress on the necessity of obtaining these from healthy plants, and especially warns new growers not to purchase their slips simply because they are cheap. It would be to the advantage of such growers to have the suckers examined and selected by the Department.—W. J. Allen.

# Soil Improvement for Maize.

## I.—Manures and Fertilisers.

[Continued from page 116.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

### Nitrogen from Fertilisers and from Leguminous Crops.

The chief fertilisers supplying the element nitrogen are sulphate of ammonia (20 per cent.), nitrate of soda (15 per cent.), dried blood (13 per cent.) and bonedust (4 per cent.); of these, nitrate of soda and sulphate of ammonia are water soluble, or can supply their nitrogen in a readily available form; dried blood and bonedust are slower acting.

From the tables on page 114 of last month's issue it will be seen that a 50-bushel crop of maize removes at least 50 lb. nitrogen per acre from the soil, while the usual applications of nitrogenous fertilisers supply only 10 or 11 lb. of nitrogen per acre. These fertilisers can only then be considered to have a stimulating effect, such as to increase the early root development. Heavier applications are at present precluded on account of the cost of these fertilisers—especially in the case of nitrate of soda and sulphate of ammonia. The latest prices of commercial fertilisers show that every pound of nitrogen costs from 10½d. to 1s., each pound of phosphoric acid 2½d. to 3d., and each pound of potash about 4d.; nitrogen is therefore by far the most costly element to purchase in commercial fertilisers. As the loss of this element is also the greatest in systems of continuous maize growing, it is apparent that the situation would be at once serious but for the simple fact that the atmosphere consists of four-fifths of nitrogen, and that leguminous plants (peas, beans, vetches, cowpeas, lucerne, clovers and trefoils, &c.) have the power of extracting nitrogen from the air and of utilising it by means of organisms which are contained in the nodules to be seen on the roots of these plants. It is calculated that there is sufficient nitrogen in the air above an acre of ground to produce 100-bushel maize crops for 500,000 years! In view of these facts, it is no wonder that attention has been turned to obtaining nitrogen from this cheap source by means of legumes, to provide for the loss of this element from the soil which heavy crops of maize entail. The majority of farmers do not sufficiently realise the imp rtance of legumes in this respect—though the value of ploughing in green leguminous crops was known to the cultivators of the soil in the years B.C.

Every farmer who has grown peas, vetches, cowpeas, or velvet beans (which only occupy the ground a comparatively short time), or lucerne and red clover (perennial or biennial legumes), has observed the beneficial effect on the following crops, even when the top growth is removed, as compared with land where no legumes have been grown. Farmers should not, however, be deluded into the belief that such a system of growing legumes and such

treatment of them (that is, their removal instead of ploughing in or feeding off), especially in the case of short season annual leguminous crops, will increase the nitrogen in the soil. Better results may be seen in a crop like maize following annual legumes like peas or vetches which have been cut for fodder or hay as compared with maize following no legume, but this merely serves to emphasise how fast the land is being depleted of nitrogen without a leguminous crop. As a rule, the nitrogen in the roots and stubble of leguminous plants about equals the amount of this element taken from the soil; and when the tops are removed the nitrogen is just barely maintained in the soil, but not increased. There seems to be an impression amongst some farmers that the nitrogen obtained from the air by the bacteria is all present in the nodules or tubercles on the roots. Usually only about one-third or less of the total nitrogen in leguminous plants is contained in the roots and stubble, and this is reckoned to be also about the same as that taken by such plants from the soil, the other two-thirds being taken from the air. It will be seen, therefore, that when the top growth of legumes is entirely removed from the soil (instead of being ploughed under or fed off) there is no actual gain in nitrogen—no more than there would be if any non-leguminous crop were grown and ploughed under entirely as green manure. As regards feeding off in comparison with ploughing under the whole crop as green manure, it may be reckoned that a quarter of the nitrogen in the feed consumed is retained by the animal, the remaining three-quarters being voided in the manure. Thus, if the nitrogen is just barely maintained in the soil by ploughing in only the roots and stubble of a leguminous crop—and even this method has been observed by farmers to be beneficial to the following crop—how much more so will be the system of feeding off or ploughing in the whole crop? In the case of lucerne and clover crops which are cut for hay several times in a season, there is at each haying an appreciable loss of leaves which are rich in nitrogen, which with the roots and stubble adds to the soil more than sufficient for maintenance of this element, so that the net result is an increase in nitrogen for the subsequent crop. If it were not for the continual loss of the leaves and the deep rooting, the lucerne crop would do no more than maintain the nitrogen in the soil, and would therefore not have such an excellent reputation for rebuilding the fertility of the soil.

The question is often raised as to whether the nitrogen of the soil can be maintained by green manuring with non-leguminous crops which are suitable for the production of organic matter (such as rye, rape, barley, &c.) as catch crops or cover crops. It is true that nitrogen is part of the organic matter, and it might be thought that if the organic matter of the soil is increased by green manuring with non-legumes that the nitrogen will be correspondingly increased. This cannot be possible, as all the nitrogen of non-legumes comes from the soil and not mostly from the air as in the case of legumes. The practice of green manuring with non-legumes, therefore, may save nitrates from being leached from the soil as would happen on fallow land during heavy rainfall, and would in many cases be better than no crop at all (except in dry districts), but it would not actually increase the nitrogen in

the soil, though it would increase the organic matter and to some extent the easily available nitrogen. At Rothamsted it was found that in land under legumes for twenty years the gain of nitrogen per acre was 6 cwt. This is equal to an average gain of 33 lb. nitrogen per year, equivalent to an annual dressing of about 2 cwt. nitrate of soda or sulphate of ammonia per acre (which would be at a cost of about 40s.).

Another question of interest is how much nitrogen is added to the soil from a leguminous crop which is grown for seed? An average crop of cowpeas will contain 120 lb. nitrogen per acre in the whole plant including the roots, and of this amount about 60 lb. will be contained in the seed. As two-thirds of the total nitrogen is obtained from the air, 80 lb. will therefore be added to the soil from this source and there will be a balance of 20 lb. nitrogen per acre to the credit of the soil if the straw is returned to it and only the seed is removed.

The nitrogen added to the soil per acre by different methods of dealing with an average annual leguminous crop like cowpeas or field peas, may be therefore roughly expressed as follows:—

| | |
|---|---|
| Ploughing in whole crop as green manure ... ... ... ... | 80 lb. |
| Feeding off (or soiling and returning animal manure to the soil) ... | 60 lb. |
| Growing crop for seed (returning straw to soil) ... ... ... | 20 lb. |
| Removing crop (ploughing in only roots and stubble) ... ... | Nil. |

It was once thought that legumes obtained practically all the nitrogen for their growth from the atmosphere, but it will be seen that until the nodules form on the roots no nitrogen can be taken from this source. Easily available or soluble fertilisers containing nitrogen may be therefore of value in giving these legumes a good start until the nodules form. There is a danger, however, in providing these plants with too much nitrogen in this form, as they will take the available nitrogen from the soil in preference to fixing this element from the air. The object of growing the legumes would thus be lost, as all efforts should be directed towards making this transfer from the air to the soil as large as possible for the benefit of following crops like maize, which consume such large quantities of nitrogen. Inoculation of seed or soil with soil containing the organisms (from an old field) is now largely used with success in America to take the place of these nitrogenous fertilisers for legumes, to give them the quick start required and to save drawing on the soil's supply of nitrogen. It has been found that where inoculation in this way has been properly done, the increase of nitrogen in the plant, and consequently in the soil, is much greater than would take place without inoculation.

Another reason why it is better to rely on legumes rather than on soluble fertilisers for adding the bulk of the nitrogen necessary for maize growing is that in the case of the latter, which are either in the form of soluble nitrates or which are soon oxidised to that form, up to one-third or more of the nitrogen may be lost through leaching. This loss takes place most in a sandy or sandy loam soil. The nitrogen from legumes ploughed into the soil as green manure is in an organic form and is converted slowly into soluble nitrates (nitrification) with rising soil temperatures, so that no great loss of this element can occur in this method of application.

The following results have been obtained from experiments with sulphate of ammonia applied at planting :—

RESULTS of Tests with Sulphate of Ammonia applied at Planting.

| District. | Yield per Acre. | | Effect on yield of ½ cwt. of Sulphate of Ammonia added. |
|---|---|---|---|
| | 1 cwt. Superphosphate. | 1½ cwt. M5 Mixture.* | |
| | bus. lb. | bus. lb. | bus. lb. |
| North Coast—Average of 14 tests ... | 54 51 | 51 49 | 3 2 decrease |
| Northern Tableland—Average of 2 tests | 26 49 | 28 51 | 2 2 increase |
| Tumut District—Average of 3 tests ... | 31 17 | 36 43 | 5 26 ,, |

* M5 mixture consists of 1 cwt. Superphosphate and ½ cwt. Sulphate of Ammonia.

On the North Coast it may be assumed that, owing to the long hot summer, nitrates are formed in the soil sufficiently rapidly for the crop's requirements, and that when soluble nitrogenous fertilisers are applied they have the effect of inducing a too fast and soft, sappy growth which cannot stand the extreme heat, and which dry weather and fungus diseases more easily affect, to the detriment of the yield. In colder districts such as the Northern Tableland and Tumut, the conditions are decidedly cool in spring, and the young maize plants probably find a deficiency of available nitrogen at that time (due to slow nitrification), and soluble nitrogenous fertilisers like sulphate of ammonia or nitrate of soda give the crop a quick start, which is reflected in a profitable increase. For this purpose ½ to ¾ cwt. per acre of these fertilisers is quite sufficient to apply, larger amounts being too costly to apply at the present prices.

Experiments to determine the value of nitrate of soda as a top dressing or side dressing applied to maize six or eight weeks after planting have been carried out in this State with the following results :—

RESULTS of Tests with Nitrate of Soda as a top-dressing.

| Locality. | Season. | Yield per acre. | |
|---|---|---|---|
| | | No Top Dressing. | Top Dressing (½ cwt. Nitrate of Soda per acre.) |
| | | bus. lb. | bus. lb. |
| Yorklea ... | 1917–18 | 67 38 | 62 48 |
| Coramba ... | 1917–18 | 58 17 | 44 51 |
| Milton ... ... | 1917–18 | 64 52 | 68 8 |
| Tenterfield ... | 1917–18 | 21 0 | 25 10 |
| Tinonee ... | 1917–18 | 75 9 | 87 28 |
| Inverell ... | 1917–18 | 39 54 | 33 13 |
| Dorrigo ... | 1918–19 | 47 28 | 36 28 |
| Lawrence ... | 1918–19 | 57 42 | 61 0 |
| Comboyne .. | 1918–19 | 61 41 | 59 27 |
| Dungog ... | 1918–19 | 75 0 | 73 9 |
| Average (10 tests) ... | | 57 16 | 55 27 |

There thus appears to be little hope of a profitable increase from the top-dressing with nitrate of soda for maize on most soils.

### Phosphatic Fertilisers.

The chief fertilisers supplying phosphorus are superphosphate (17 per cent. phosphoric acid, water soluble) and bonedust (22 per cent., not water soluble). The water solubility of superphosphate ensures the immediate availability of part of the phosphorus, and is evidenced by the stimulus (especially to root development) given to the young maize seedlings in almost every case where this fertiliser is applied with the seed. Much of this soluble phosphate soon becomes reverted to an insoluble form in the soil, but in such a fine state of mechanical division that it is still considered readily available for the use of the plant. Bonedust is, however, quite insoluble until decomposed, and is likely to be of most value as a fertiliser for maize where decomposition takes place most readily, that is, in the presence of heat and moisture (for example, chiefly in the coastal districts). Striking success has followed the application of a mixture of equal parts of superphosphate and bonedust for maize (and for potatoes) on the coastal alluvial and volcanic soils. It may be that the superphosphate supplies the essential phosphorus to the young plant, and that part of the plant food of the bonedust is available to the plant at its later and more critical stages of growth, and during the filling of the cob. Perhaps, too, superphosphate acts on the bonedust in some way, and renders its phosphorus more quickly available. Whatever the cause, no fertiliser mixture yet tried has given such almost unexpectedly successful results as those obtained by this simple mixture on the coast during the last few years.

It has been said that phosphorus is the limiting element in the production of crops in Australia, because of the natural deficiency in most soils and also on account of the fact that in systems of grain farming this element is most largely removed in the grain, while the only source of replenishment is the artificial fertiliser. This is just as true in relation to maize-growing on our soils, except that the loss from the farm of the phosphorus may be minimised to a greater extent on account of maize being such an excellent food for stock of all kinds and of the greater profits generally obtainable from the use of the crop in this way.

Even so, it has already been shown that animal manure is deficient in phosphorus as compared with nitrogen and potash, and the utilisation of grain for feeding stock on the farm can only defer somewhat the need for this element from outside sources, such as fertilisers. It is withal the cheapest element to buy, and one which usually yields a high percentage return on the investment. In systems of green manuring—especially on less fertile soil—it usually causes a greatly increased growth of legumes, such as cowpeas, peas, vetches, lucerne or clover, and thereby largely augments the supply of organic matter, which may be the limiting factor in crop yields on such soils. Indeed, the lack of nitrogen and organic matter in the soil may easily render the application of phosphatic fertilisers unprofitable—a state of things often leading to their wrongful condemnation.

### Superphosphate and Rock Phosphate.

Following the discovery of a rock phosphate a few years ago in New South Wales, there has been much inquiry as to its effectiveness on different crops as compared with superphosphate, and some experiments have been carried out to determine its value as a fertiliser for maize in this State.

Rock phosphate is the material from which superphosphate is manufactured by treatment with sulphuric acid. Different grades of it occur, but none contain any water soluble phosphate. Ground to a fine state of division (in which form it is sold as fertiliser) it contains about 20 to 30 per cent. phosphoric acid soluble in strong acid, which is considered to be only slowly available to plants.

The late Dr. C. G. Hopkins, of the Illinois Agricultural Experiment Station, has been the champion of this fertiliser in the United States, and has aroused there a good deal of criticism because of his contention that ground raw rock phosphate is the only fertiliser many farmers need buy. As the result of many years' experiments at Illinois, he claimed that organic matter, such as green manure, crop residue, and animal manure, need only be added to the soil to make the phosphate from the insoluble ground rock available to plants as food, the carbonic and other organic acids set free by the decay of the organic matter taking the place of the sulphuric acid used by the manufacturers. He gives* the following points in favour of the use of raw rock phosphate as compared with superphosphate :—

1. Lower price per pound of phosphorus.
2. Low grades of phosphate containing iron and alumina require larger use of sulphuric acid and also make an unsatisfactory product.
3. It is free from acidity and has no tendency to injure the soil.
4. It is present in all natural soil material, the phosphate being liberated for plant use by farmyard or animal manures and green manures before the manufacture of superphosphate was ever thought of.

A comparison of the prices of raw rock phosphate and superphosphate in America† shows the former in 1917 to have been less than half the price of the latter (rock phosphate 30s. per ton, superphosphate 70s. per ton), though a little more than half the price in 1914. Even with this disparity in price, the results of twelve years' experiments on maize show a larger net gain from superphosphate, with but very little increased gain when animal manure was also added. In our own State, while superphosphate was quoted at £5 per ton, rock phosphate commanded £6 per ton. There seems no reason why the latter should be dearer than superphosphate, considering the extra cost of treatment and the high price of sulphuric acid at present. It certainly seems a less valuable fertiliser for our conditions, and while it remains at this price, or until it falls to somewhere near half the cost of superphosphate, it can scarcely be thought of.

* "Soil Fertility and Permanent Agriculture," p. 242.
† Ohio Mon. Bull. 2, No. 12 (December, 1917).

It is apparently a fact that it is in any case unwise to apply rock phosphate to soil which is lacking in organic matter, but Truog* has put forward an interesting theory that the solubility of phosphates is not the only factor that determines the growth of the plant on different phosphates. He states that plants containing a relatively high lime content have a relatively high feeding power for raw rock phosphate, and that for plants containing a relatively low lime content the converse of this is true. A lime content of less than 1 per cent. may be considered relatively low. In this class are millet, wheat, oats, rye, maize, barley (ranging from 0·46 per cent. to 0·90 per cent.). A lime content of over 1 per cent. may be considered relatively high. This class includes rape, peas, lucerne, lupines, buckwheat, tobacco, turnips (ranging from 1·78 per cent. to 3·83 per cent.). As would be expected from the above, experiments carried out in New South Wales with wheat and maize to compare the immediate effects of superphosphate and rock phosphate on yield have shown decidedly in favour of superphosphate. The residual effect of rock phosphate has not, however, been tested; and if it can be obtained at a reasonable price in Australia or from the island deposits in close proximity to Australia, its value in this respect (for the question of permanent fertility must be considered) and for the plants of high lime content mentioned above is at least worth testing.

Following are the results of experiments carried out with maize in New South Wales with rock phosphate (Wellington) in comparison with superphosphate :—

| Locality. | Season. | No Manure. | | Yield per acre. 2 cwt. Rock phosphate. | | Yield per acre. 2 cwt. Superphosphate. | |
|---|---|---|---|---|---|---|---|
| | | bus. | lb. | bus. | lb. | bus. | lb. |
| Grafton Experiment Farm ... ... | 1915–16 | 42 | 50 | 46 | 45 | 52 | 0 |
| ,, ,, ... ... | 1916–17 | 52 | 6 | 54 | 45 | 63 | 28 |
| Hawkesbury Agricultural College ... | 1915–16 | 13 | 14 | 13 | 6 | 17 | 45 |
| ,, ,, ... | 1916–17 | 52 | 6 | 54 | 45 | 63 | 28 |
| Tinonee ... ... ... ... ... | 1917–18 | 75 | 0 | 72 | 28 | 75 | 0 |
| Average yield ... | | 47 | 4 | 48 | 0 | 54 | 20 |

*(To be continued.)*

## The "Leaf-cutting" Bee.

Reporting on a species of fly, said to be eating tops of *Acacia pycnantha* in the neighbourhood of Narrabri, the Government Entomologist wrote :—

The insect is a native bee belonging to the genus Megachile; it is known as the "leaf-cutting bee" because it cuts off bits of leaves and carries them into the cavity where it constructs its nest, and wherein it makes them into oval cells. This bee often attacks rose bushes in gardens. The damage it does is not likely to be serious to the trees it visits.

* Wisconsin Univ. Agr. Expt. Sta. Research Bull. 41 (1916).

## TELEGONY.

THERE is a widespread belief amongst breeders that the male with which a female is first mated has an influence upon the progeny of the female by a different sire at a later period. Nowhere is this belief more strongly held than among breeders of dogs, and a pure-bred bitch which has been mated with a dog of another breed is usually regarded as quite worthless for the purpose of breeding pure-bred stock at any subsequent period. When sifted, however, the evidence offered in support of this theory as to the influence of the first sire generally proves to be unreliable.

The doctrine of the infection of the germ, now known as telegony, was more or less firmly believed in by men of science, as well as breeders, up to the end of the nineteenth century. Beecher, writing at the close of the seventeenth century, says: "When a mare has had a mule by an ass and afterwards a foal by a horse there are evidently marks on the foal of the mother having retained some ideas of her former paramour, the ass." Agassiz held that the ovary was so modified by the first act of fecundation that "later impregnations do not efface the first impressions."

In 1895 Professor Cossar Ewart initiated some experiments to test the truth or otherwise of the doctrine of the infection of the germ. The classical experiment, which is frequently quoted in connection with telegony, was that conducted many years ago by Lord Montagu, when a male quagga and a seven-eighths Arabian mare were mated. For this reason Professor Cossar Ewart decided to repeat the experiments as closely as possible. The quagga, however, had become extinct. A Burchell's zebra was therefore mated with Arab and other mares belonging to different breeds and strains, and the mares, after producing one or more hybrids, were mated with Arab and other stallions. Professor Ewart published an account of his experiments in the "Transactions of the Highland and Agricultural Society of Scotland" in 1902. Here he stated that, although he started with the belief that there was such a thing as telegony, he eventually came to the conclusion that "there never has been an undoubted instance of infection in either dogs, rabbits, or horses." Professor Ewart recently pointed out that this view is supported by a statement of Jordan and Kellog, in America, who "think it probable that the phenomena called telegony have no real existence."

It seems, then, that the views so long held in regard to telegony will have to be discarded, and that it is quite unnecessary to regard as worthless for breeding pure-bred animals those females which have not been in the first instance mated to pure stock.—G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S.

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## THE ACTIVITIES OF AGRICULTURAL COLLEGES.

I KEENLY recognise that the Agricultural Colleges of the States, like the Federal Department itself, are now confronted with unusual difficulties and are labouring under serious embarrassments; and yet in the midst of these they are called upon to render even more urgent service. I have long had an exalted opinion of the value of these institutions to our democracy. Recent events have caused me even more highly to prize them and more clearly to recognise their need. They have made it singularly clear that agricultural institutions must omit no step to add, through research and experiment, to the sum of our scientific knowledge.—D. F. HOUSTON, Secretary of Agriculture, Washington, U.S.A.

# List of Fertilisers in New South Wales.

F. B. GUTHRIE, A. A. RAMSAY, R. M. PETRIE, AND F. J. STOKES.

## 1920 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, is the result of the revision of the list issued in March, 1919.

The list is published in the interests of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Fertilisers Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

On account of the unsettled conditions obtaining at present, the market value of these manures may alter. An attempt has, however, been made to assign a "unit value" to the fertilising ingredients, viz., nitrogen, phosphoric acid, and potash, as in pre-war years.

The recent arrival of consignments of potash salts from Alsace permits of a unit value being assigned to potash. A note dealing with the French potash salts appeared in the *Agricultural Gazette* last month.

A word is necessary in explanation of the column giving the "manurial value" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values given are computed are as follows:—

UNIT-VALUES of fertilising ingredients in different manures for 1920.

| | Per unit. s. | d. |
|---|---|---|
| Nitrogen in nitrate ... ... ... ... ... ... ... ... | 33 | 4 |
| ,, in ammonium salts ... ... ... ... ... ... ... | 20 | 2 |
| ,, in blood, bones, offal, &c.—fine ... ... ... ... ... | 25 | 0 |
| Phosphoric acid in bones, offal, &c.—fine ... ... ... ... ... | 5 | 1 |
| Phosphoric acid (water soluble) in superphosphates ... ... ... | 6 | 8 |
| Potash in muriate of potash ... ... ... ... ... ... ... | 11 | 6 |

PRICE per lb. of fertilising ingredients in different manures for 1920.

| | Pence per lb. |
|---|---|
| Nitrogen in nitrate ... ... ... ... ... .. ... ... | 17·9 |
| ,, in ammonium salts ... ... ... ... ... ... ... | 10·8 |
| ,, in blood, bones, offal, &c.—fine ... ... ... ... ... | 13·4 |
| Phosphoric acid in bones, offal, &c.—fine ... ... ... ... ... | 2·7 |
| Phosphoric acid (water soluble) in superphosphates ... ... ... | 3·6 |
| Potash in muriate of potash ... ... ... ... ... ... ... | 6·2 |

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value per ton of that substance in the manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :—

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | × | 25s. 0d. | = | £5 0s. 0d. | = | value of the nitrogen per ton. |
| 20 | × | 5s. 1d. | = | £5 1s. 8d. | = | ,, phosphoric acid per ton. |
| | | | | £10 1s. 8d. | = | value of manure per ton. |

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

These figures have been checked by analyses of samples collected by an officer of the Department. It by no means follows, however, that the particular product analysed and here published will be in stock for any length of time.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one is shown in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example, if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

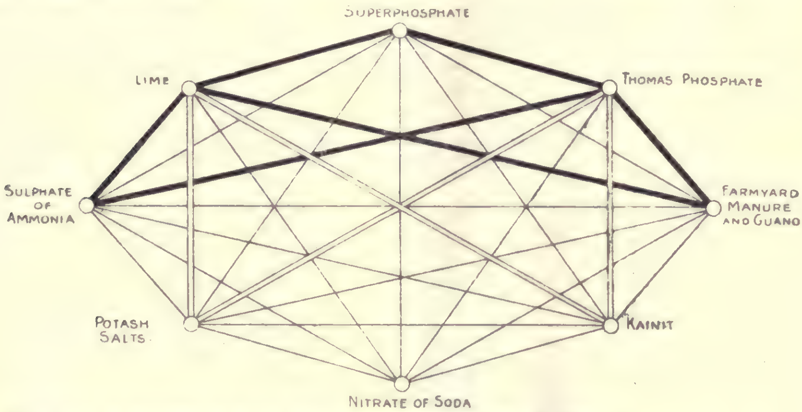
In the case of bonedust, blood and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bonedust acts more rapidly than coarse, and that unground fragments of bone only become available as fertiliser very slowly.

In the fourth table are a number of waste products which may in many cases be economically utilised.

When purchasing a manure, always insist on a guarantee of its composition as determined by the analysis.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results: and when lime has been applied to the land, do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures.




Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

TABLE I.—SIMPLE FERTILISERS.

| Manure. | Where obtainable. | Guaranteed Composition. Nitrogen. | Equal to Ammonia. | Lime. | Potash. | Phosphoric Acid. | Manurial Value. |
|---|---|---|---|---|---|---|---|
| | | per cent. | per cent. | per cent. | per cent. | per cent. | £ s. d. |
| Sulphate of ammonia | Geo. Shirley, Ltd., 7 O'Connell-st. . | 20·0 | 24·29 | .. | .. | .. | 20 3 4 |
| Nitrate of soda .. | ,, ,, .. | 15·0 | 18·21 | .. | .. | .. | .... |
| Muriate of potash .. | ,, ,, | .. | .. | .. | 5[illegible] | .. | 29 18 0 |
| ,, ,, .. | ,, , .. | .. | .. | .. | 58 | .. | 33 7 0 |
| Sulphate of ammonia | Australian Gaslight Co., Parker-st., Haymarket. | 20·0 | 24·29 | .. | .. | .. | 20 3 4 |
| ,, ,, | Farmers' Fertilisers Corporation, 31 Hunter-st | 20·5 | 24·89 | .. | .. | . | 20 13 5 |
| Muriate of potash .. | ,, ,, ,, .. | .. | .. | .. | 53 | .. | 30 9 6 |
| ,, ,, .. | ,, ,, ,, .. | .. | .. | .. | 59 | .. | 33 18 6 |
| Agricultural lime. (Burnt lime air slaked). | ,, ,, ,, .. | .. | .. | .. | .. | .. | .... |
| Gypsum .. .. | ,, ,, ,, .. | .. | .. | 96 Cryst. $CaSO_4$ | .. | .. | ... |
| Sulphate of ammonia | Paton, Burns, & Co., 75 York-st. .. | 20·4 | 24·77 | .. | .. | .. | 20 11 5 |
| Muriate of potash .. | ,, ,, ,, .. | .. | .. | .. | 52 | .. | 29 18 0 |
| ,, ,, .. | ,, ,, ,, .. | .. | .. | .. | 58 | .. | 33 7 0 |
| Nitrate of soda .. | ,, ,, ,, .. | 15·7 | 19·06 | .. | .. | .. | .. |

## II.—Bone and Blood Manures.

| Manure. | Where obtainable. | Guaranteed Composition. Nitrogen. | Equal to Ammonia. | Phosphoric Acid. | Equal to Tricalcic Phosphate. | Manurial Value. |
|---|---|---|---|---|---|---|
| | | per cent. | per cent. | per cent. | per cent. | £ s. d. |
| Bonedust ... ... ... ... | Geo. Shirley, Ltd., 7 O'Connell-st. ... ... ... | 3·7 | 4·49 | 22·0 | 48·05 | 10 4 4 |
| No. 1 Bone and blood ... ... | ,, ,, ... ... | 5·0 | 6·07 | 17·0 | 37·11 | 10 11 5 |
| No. 2 ,, ,, ... ... | ,, ,, ... ... | 5·0 | 6·07 | 13·0 | 28·38 | 9 11 1 |
| Bone and blood ... ... ... | Farmers' Fertilisers Corp., Ltd., 31 Hunter-st. ... | 5·32 | 6·46 | 19·14 | 41·78 | 11 10 4 |
| ,, ,, ... ... ... | R. S. Lamb & Co., 32 Jamieson-st. ... ... ... | 5·0 | 6·07 | 11·9 | 25·98 | 9 5 6 |
| Bonedust ... ... ... ... | M. O'Riordan and Sons, O'Riordan-st., Alexandria | 3·7 | 4·5 | 21·98 | 48·0 | 10 4 3 |
| B. and B. manure ... ... ... | Kitchen and Sons, Ltd., 365 Kent-st. ... ... | 5·0 | 6·07 | 17·0 | 37·11 | 10 11 5 |
| Extra B. and B. manure ... ... | ,, ,, ,, ... ... | 5·0 | 6·07 | 13·0 | 28·38 | 9 11 1 |
| Bone and offal ... ... ... | Newcastle District Abattoir Board, 27 Hunter-st., Newcastle. | 5·02 | 6·10 | 19·89 | 43·42 | 11 6 7 |
| Dried blood ... ... ... .. | ,, ,, ,, ,, ... | 13·29 | 16·14 | ...... | ...... | 16 12 3 |
| Bonedust, B.D. 1 ... .. ... | Paton, Burns, & Co., 75 York-st. ... ... ... | 3·7 | 4·49 | 22·12 | 49·29 | 10 4 11 |
| ,, B.D. 2 ... ... ... | ,, ,, ,, ... ... .. | 3·7 | 4·49 | 22·12 | 49·29 | 10 4 11 |
| ,, B.D. 3 ... ... ... | ,, ,, ,, ... ... ... | 3·3 | 4·01 | 20·7 | 45·19 | 9 7 9 |
| Blood and bone manure, B.B. 1 ... | ,, ,, ,, ... ... ... | 8·0 | 9·71 | 8·0 | 17·46 | 12 0 8 |
| ,, ,, ,, B.B. 2 ... | ,, ,, ,, ... ... ... | 5·0 | 6·07 | 17·0 | 37·11 | 10 11 5 |
| Bone phosphate ... ... ... | ,, ,, ,, .. ... ... | ...... | ..... | 29·77 | 64·99 | ...... |
| Dried blood ... ... ... ... | ,, ,, ,, ... ... ... | 11·0 | 13·36 | ...... | ...... | 13 15 0 |
| No. 2—Pure steamed bonedust ... | Wooster Fertilisers, Ltd., O'Riordan-st., Alexandria | 3·9 | 4·75 | 24·50 | 53·5 | 11 2 0 |
| No. 3—Blood and bonedust ... | ,, ,, ,, ... ... | 5·76 | 7·00 | 13·74 | 30·0 | 10 13 10 |
| No. 5—Raw bonedust ... ... | ,, ,, ,, ... ... | 4·01 | 4·86 | 24·41 | 53·30 | 11 4 4 |
| Sandown blood and bone fertiliser... | J. Cooke & Co., Propy., Ltd., Sandown Works, Parramatta. | 6·85 | 8·32 | 11·40 | 25·5 | 11 9 2 |
| Excelsior bonedust ... ... | M. Gearin and Sons, Old Botany road, Mascot ... | 3·29 | 4·00 | 21·98 | 48·00 | 9 14 0 |
| Pure fertiliser ... ... .. | N.S.W. State Abattoirs, Homebush Bay ... ... | 6·68 | 8·11 | 10·87 | 23·73 | 11 2 3 |
| Blood ... ... ... ... ... | B. Richards and Sons, Ltd., Riverstone ... ... | 13·70 | 16·64 | .. ... | ...... | 17 2 6 |
| Bonedust ... ... ... ... | ,, ,, ,, ... ... | 3·17 | 3·85 | 26·78 | 58·46 | 10 15 5 |

## III.—Superphosphates, Mixed Fertilisers, and Imported Fertilisers.

| Manure. | Where obtainable. | Guaranteed Composition. | | | | Manurial Value. |
|---|---|---|---|---|---|---|
| | | Nitrogen. | Water-soluble Phosphoric Acid. | Total Phosphoric Acid. | Potash. | |
| | | per cent. | per cent. | per cent. | per cent. | £ s. d. |
| Standard Superphosphate | Geo. Shirley, Ltd., 7 O'Connell-st. | ...... | 17·0 | ...... | ..... | 5 13 4 |
| Basic Superphosphate | " " | ...... | ...... | 20·0 | ...... | ...... |
| No. 2 | " " | 2 | 10 | ...... | 1 | 5 18 6 |
| No. 4 | " " | 4 | 8 | ...... | 2 | 7 17 0 |
| No. 5 | " " | 3 | 10 | ...... | 7 | 10 7 8 |
| No. 6 | " " | 3 | 10 | ...... | 4 | 8 13 2 |
| No. 8 | " " | 4 | 11 | ...... | ...... | 7 14 0 |
| No. 10 | " " | 2 | 13 | ...... | ...... | 6 7 0 |
| No. 11 | " " | ...... | 12 | ...... | 4 | 6 6 0 |
| Bone and Superphosphate mixture | " " | 1·85 | 8·5 | 19·5 | ..... | 7 18 10 |
| No. 1 Superphosphate | Farmers' Fertilisers Corp., Ltd., 31 Hunter-st. | ...... | 17·0 | ...... | ...... | 5 13 4 |
| Superphosphate | Paton, Burns, & Co., 75 York-st. | ...... | 17·0 | ...... | ...... | 5 13 4 |
| No. 7 Complete fertiliser | Wooster Fertilisers, Ltd., O'Riordan-street, Alexandria. | 5·01 | 2·0 | 14·56 | 2 | 10 19 8 |
| No. 0 Phosphatic fertiliser | " " " | 3·30 | 4·75 | 20·61 | ...... | 9 14 9 |
| Sulphide Superphosphate | Gibbs, Bright & Co., 37 Pitt-street | ...... | 17·0 | ...... | ...... | 5 13 4 |
| Nitro " | " " | 1·60 | 15·0 | ...... | ...... | 6 15 2 |
| No. 1 Bone and " | " " | 1·50 | 8·5 | 19·0 | ...... | 7 7 6 |
| No. 2 " " | " " | 0·8 | 13·0 | 19·0 | ...... | 6 17 2 |
| Potato manure | " " | 1·25 | 14·5 | 16·0 | 3·5 | 8 9 9 |
| Orchard " | " " | 2·30 | 13·0 | 14·50 | 4·5 | 9 12 5 |
| Maize and fodder crop | " " | 3·0 | 11·00 | 14·00 | 1·0 | 8 8 3 |
| Root crop | " " | 3·25 | 7·50 | 11·00 | 3·0 | 8 13 10 |
| Leguminous | " " | ...... | 15·50 | 18·00 | 2·40 | 7 3 8 |
| Special orchard manure | " " | 2·30 | 12·00 | 12·80 | 7·25 | 10 13 10 |

### IV.—Waste-Products, Ashes, &c., not on the Market.

| Manure. | Original Source. | Water. | Volatile and Combustible. | Nitrogen. | Insoluble. | Lime. | Phosphoric Acid. | Potash. |
|---|---|---|---|---|---|---|---|---|
| | | per cent | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| Deposit from wool-scouring tanks 1 | Liverpool Wool-scouring Works | ... | ... | ·64 | ... | ... | ... | ·72 |
| Deposit from wool-scouring tanks 2 | ,, ,, ,, | ... | ... | 1·02 | ... | ... | ·16 | ·39 |
| Deposit from wool-scouring tanks 3 | ,, ,, ,, | ... | ... | 1·37 | ... | ... | ·14 | ·2 |
| Deposit from breakers | ,, ,, ,, | 34·47 | | 1·81 | 50·68 | ·85 | ·88 | 1·60 |
| Sediment from wool-scouring works | Yass | 19·57 | | ·59 | 8·24 | ·97 | .... | ·20 |
| Scutch | Australian Glue-Gelatin Works, Alexandria. | 56·98 | ... | 2·95 | ... | 4·56 | None. | None |
| ,, from limed pelts | Hugh Wright, Auburn | 5·22 | 72·42 | 1·80 | 3·61 | 9·36 | ·89 | ·20 |
| Decomposed hair and lime | Fellmongery | 9·70 | 57·08 | 6·86 | 1·22 | 26·27 | ... | ... |
| Tan-yard refuse | Tanneries, St. Mary's | 6·43 | 33·83 | 2·24 | 21·43 | 26·96 | ·67 | ... |
| Tan refuse | ... | 7·10 | 50·90 | 2·62 | 16·03 | 18·58 | ·56 | ·18 |
| Fleshings from tannery | ... | ·91 | 75·37 | 44·43 | 5·98 | ... | 1·14 | ·04 |
| Salt (sweepings from tannery) | ... | 3·04 | ... | ·70 | ·38 | ... | ... | ... |
| Wool-waste | ... | ... | ... | 8·15 | ... | ... | ... | ... |
| ,, | ... | 34·33 | 28·20 | 1·97 | 26·03 | 2·75 | ·37 | ·32 |
| Peat | H. Tager, Moss Vale | 72·93 | 16·68 | ·35 | 10·39 (ash). | ... | ... | ... |
| ,, | S. Cook, Pyrmont | 40·51 | 34·63 | ·75 | ... | ... | ·06 | ·01 |
| Burnt peat | ... | ... | ... | ... | 84·45 | ... | ·25 | ·33 |
| Filter-press muck | Cane-mills, Broadwater | 16·39 | 26·07 | ·22 | 34·86 | 13·20 | 5·98 | ·44 |
| Megass | Clarence River cane | 22·86 | 67·32 | ·63 | 8·61 | ·30 | 01 | ·05 |
| Megass ash | ,, | ... | ... | ... | 87·69 | 3·07 | ·16 | ·51 |
| ,, | Richmond River cane | ... | ... | ... | ... | 1·11 | ·21 | 4·79 |
| Bloodwood ash | ... | ... | ... | ... | ... | 8·47 | ·27 | 5·25 |
| Ironbark ash | ... | ... | ... | ... | ... | ... | ·82 | 1·53 |
| Blackbutt ash | ... | ... | ... | ... | ... | 7·27 | ·04 | 2·02 |
| Red-gum ash | ... | ... | ... | ... | ... | ... | ·38 | 4·17 |
| Spotted-gum ash | ... | ... | ... | ... | ... | ... | ·10 | ·70 |
| Boxwood ash | ... | ... | ... | ... | ... | ... | ·67 | 1·65 |
| Grass-tree ash | ... | ·86 | 1·78 | ... | 33·48 | 24·94 | 3·07 | 5·30 |
| Vine-cuttings ash | ... | ·49 | ... | ... | 60·64 | 11·34 | 1·85 | 3·76 |
| Red-apple ash | ... | ... | ... | ... | 54·52 | 13·96 | ·47 | 6·00 |
| She-oak ash | ... | ... | ... | ... | 8·57 | 42·35 | 8·85 | 2·19 |
| Hardwood ash | ... | ·50 | 1·35 | ... | 62·38 | 13·50 | 1·76 | 3·09 |
| Ash of wild melon | Stock Branch | ... | ... | ... | ... | 5·12 | 4·85 | 27·08 |
| Wood ashes | ... | ·30 | ... | ... | 21·43 | 41·37 | 35 | 2·80 |
| ,, | Wentworth Irrigation Area | ... | ... | ... | 11·12 | 50·78 | ·58 | 3·21 |
| Ash of kerosene shale | Hartley Vale | 1·49 | 27·93 | ·70 | 67·59 | ... | ·28 | ·14 |
| Eucalyptus leaves ash | ... | ... | ... | ... | ... | ... | ... | 10·54 |
| ,, ,, | ... | ... | ... | ... | ... | ... | ... | 20·50 |
| Camphor laurel ash | ... | ... | ... | ... | ... | ... | ... | 2·55 |
| Coachwood and sassafras wood ash | ... | ... | ... | ... | ... | 16·16 | 3·60 | 13·53 |
| Gidgea wood ash | ... | ... | ... | ... | ... | 40·3 | ·36 | ·25 |
| Bracken fern ash | ... | ... | ... | ... | 56·17 | 9·64 | 5·09 | 4·98 |
| Broom millet ash | ... | 2·59 | ... | ... | 57·23 | 6·11 | 4·67 | 15·53 |

## IV.—Waste-Products, Ashes, &c., not on the Market—*continued*.

| Manure. | Original Source. | Water. | Volatile and Combustible. | Nitrogen. | Insoluble. | Lime. | Phosphoric Acid. | Potash. |
|---|---|---|---|---|---|---|---|---|
| | | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| Coals (ash) | ........ | ........ | ........ | ........ | ........ | ·64 | ·29 | ·16 |
| Clinker from locomotive boiler | ........ | ........ | ........ | ........ | ........ | ........ | ........ | ·25 |
| Residue from furnace | R. E. Bragg, Marrickville | 1·55 | 35·63 | ·54 | 52·40 | ·64 | ·43 | ·09 |
| Sea-weed ash | ........ | ........ | ........ | ........ | ........ | 9·27 | ·49 | ·59 |
| " | ........ | ........ | ........ | ........ | ........ | 6·29 | 1·27 | 17·55 |
| " | ........ | ·43 | ........ | ........ | 56·28 | 9·39 | ·47 | 2·26 |
| " | Manly | ........ | ........ | ........ | 43·06 | 6·52 | ·91 | 13·98 |
| " | " | ........ | ........ | ........ | ·07 | ·53 | ·19 | 34·30 |
| " | Mr. Harvey, Department | 3·25 | 19·46 | ........ | 61·63 | 4·22 | ·33 | ·22 |
| " | ........ | ........ | ........ | ........ | ........ | 4·63 | 1·00 | 31·41 |
| Sea-weed, fresh state | ........ | 80·00 | ........ | ·16 | ........ | ·41 | ·09 | 1·18 |
| Sea-weed | ........ | 41·03 | 42·49 | ·14 | ........ | ........ | ·21 | ·60 |
| Sea-weed, dried | ........ | 18·58 | 65·97 | 1·64 | 15·44 (ash). | 3·44 | ·14 | ·14 |
| Sea-weed, air-dried | ........ | 3·60 | ........ | ........ | 39·89 | ........ | ·42 | 1·02 |
| Air-slacked lime | ........ | 16·58 | ........ | ........ | 1·88 | 75·44 | ........ | ........ |
| Residue from calcium carbide | ........ | 41·36 | ........ | ........ | 1·08 | 36·19 | ........ | ........ |
| Limestone rock | Queanbeyan | 1·10 | ........ | ........ | 4·70 | 48·20 | 1·22 | ........ |
| Agricultural lime | Portland Cement Co. | 18·43 | ........ | ........ | 23·80 | Hydrate 13·80 Carbonate 43·97 | ........ | ........ |
| Gypsum | Marulan | (Crystallised $CaSO_4$ = 92·64) | | | 4·47 | ........ | ........ | ........ |
| Cave deposit, shells, &c. | Cowan, Hawkesbury River | 2·11 | ........ | ·82 | ........ | 35·40 | 1·59 | ·88 |
| " " | Macleay River | 23·06 | 16·01 | 2·43 | 26·77 | 13·88 | 7·40 | ........ |
| Deposit (coral, shell, &c.) | Pacific Islands | 2·13 | 13·53 | ·72 | ........ | 44·00 | 3·53 | ·39 |
| Shells | Pambula River | ........ | ........ | ........ | ........ | 44·59 | ·10 | ........ |
| Flue deposit | Maitland | ........ | ........ | ........ | 83·75 | 2·56 | ·32 | ·31 |
| " | Liverpool | ........ | ........ | ........ | 91·17 | ·42 | 1·29 | ·17 |
| " from sanitary furnace | ........ | ........ | ........ | ........ | 63·53 | 6·64 | 1·82 | 1·61 |
| " | ........ | 6·30 | 2·45 | ........ | 84·89 | ·32 | ·35 | ·38 |
| Night-soil mixed with lime | ........ | 44·33 | | ·74 | 18·60 | 7·62 | ·78 | ........ |
| Night-soil | Wagga Wagga | 6·70 | | ·03 | 82·19 | ·44 | ·28 | ·69 |
| " | " | 9·14 | | ·28 | 78·92 | 1·18 | ·18 | ·54 |
| " | " | ........ | | ·50 | ........ | ........ | ·64 | ·62 |
| Night-soil preparation, No. 1 | ........ | 8·22 | | 3·73 | 50·22 | 13·32 | 9·65 | ·91 |
| " " No. 2 | ........ | 7·20 | | 1·83 | 29·02 | 8·05 | 4·10 | ·15 |
| " " No. 3 | ........ | 25·95 | | 1·64 | 60·17 | 1·39 | 1·61 | ·70 |
| " " "Pinhoe" manure | ........ | ·92 | 9·54 | ·21 | 57·58 | 14·71 | 1·26 | ·56 |
| " " | F. Artlett, Parramatta | 7·33 | 30·06 | 2·10 | 46·38 | 2·09 | 1·92 | ·61 |
| " " | " " | 10·11 | 42·59 | 4·97 | ·94 | 30·12 | ·39 | ........ |
| " " | Mr. Halstead, O'Brien's patent | 1·54 | 12·36 | ·54 | 77·95 | ........ | ·63 | ........ |
| " " | ........ | 29·52 | 56·15 | 2·55 | 14·33 (ash). | ........ | ........ | ........ |

IV.—WASTE-PRODUCTS, ASHES, &c., NOT ON THE MARKET—*continued.*

| Manure. | Original Source. | Water. | Volatile and Combustible. | Nitrogen. | Insoluble. | Lime. | Phosphoric Acid. | Potash. |
|---|---|---|---|---|---|---|---|---|
| | | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. |
| Street sweepings | Sydney Municipal Council | 61·63 | 19·57 | ·35 | 15·45 | ........ | ·42 | ·28 |
| Farmyard manure | ........ | 67·96 | 22·09 | ·40 | 8·16 | ·16 | ·20 | ·30 |
| Stable manure | Bathurst | 39·26 | ........ | ·41 | ........ | ........ | ·27 | ·67 |
| Fowl manure | ........ | 8·95 | 16·48 | 1·47 | 70·16 | 2·10 | 1·94 | ........ |
| " | ........ | 1·54 | 15·23 | ·86 | 79·96 | ·64 | ·59 | ·33 |
| Fowlyard manure | ........ | 4·8 | 14·26 | ·91 | ........ | 3·12 | ·84 | ........ |
| Sheep manure | Bathurst | 7·73 | ........ | 1·06 | ........ | ........ | ·69 | 1·17 |
| " | Liverpool Wool-scouring Works | 9·71 | 50·91 | 1·79 | 32·26 | 2·30 | ·91 | ·92 |
| Sheep dag | ........ | ........ | ........ | 3·04 | ........ | ........ | ........ | ........ |
| Refuse manure | Abattoirs | 12·00 | 74·51 | 4·14 | 6·56 | ........ | 1·80 | ........ |
| Flying-fox manure | ........ | 1·09 | 35·34 | 3·34 | 50·29 | 1·02 | ·36 | 1·15 |
| Fish fertiliser | ........ | 14·47 | 64·36 | 10·37 | 4·52 | ........ | ........ | ........ |
| Shark fertiliser | ........ | 9·02 | 68·04 | 10·59 | 3·86 | ........ | 7·27 | ........ |
| Fish manure | ........ | 10·88 | 59·26 | 6·10 | 5·39 | 9·82 | 8·28 | ........ |
| Rabbit hair, long | Anderson, Oxford-street | 8·73 | 88·64 | 14·03 | 3·63 (ash). | ........ | ........ | ........ |
| " short | " " | 9·72 | 87·76 | 14·00 | 2·82 (ash). | ........ | ........ | ........ |
| Bat guano | ........ | 14·11 | 17·69 | 1·55 | 28·77 | 13·72 | 11·42 | ........ |
| " | ........ | 10·86 | 19·65 | 2·24 | 51·95 | 1·75 | 3·55 | ·15 |
| " | ........ | 13·70 | 34·35 | 4·76 | 3·30 | 22·28 | 13·04 | trace. |
| Bat deposit | Cave Flat, Cooradigbee | 5·43 | 12·98 | ·50 | 57·64 | 5·60 | 12·12 | ........ |
| Guano deposit | Tamworth | 8·75 | 38·40 | 6·17 | 12·85 | ........ | 9·24 | ........ |
| " | " | 8·42 | 20·97 | 3·10 | 31·89 | ........ | 7·87 | ........ |
| " | " | 14·55 | 29·91 | 3·66 | 15·81 | ........ | 12·98 | ........ |
| " | " | 9·35 | 44·32 | 6·73 | 7·33 | ........ | 13·17 | ........ |
| Ground guano | ........ | 4·57 | 11·44 | ·21 | ........ | 34·90 | 28·20 | ·22 |
| Deposit from cave | L. R. Mercy, Ashford | 23·75 | 35·57 | 3·63 | 1·65 | 16·32 | 11·28 | ·60 |
| Bone breccia | Queanbeyan | 5·71 | ........ | ·59 | 9·48 | 42·80 | 3·11 | ........ |
| Muck from waterworks reservoir | Maitland | 4·84 | 17·55 | ·74 | 63·42 | 4·56 | ·31 | ·60 |
| Muck raked from waterhole | ........ | 63·66 | 29·86 | ·81 | 3·80 | ·96 | ·10 | ·06 |
| Sawdust | ........ | 33·52 | 62·35 | ·82 | ........ | ........ | 1·70 | ·05 |
| Decayed wood, bark and leaves, bloodwood | ........ | 57·80 | | ·74 | 40·68 | 1·30 | ........ | ........ |
| Decayed wood, bark and leaves, pepper-tree | ........ | 79·92 | | ·8 | 17·77 | 1·50 | ........ | ........ |
| Coconut oil cake | ........ | 8·24 | ........ | 3·29 | ........ | ........ | 1·20 | 1·49 |
| Castor cake | ........ | 18·81 | 74·08 | 4·30 | ........ | ........ | 1·83 | ·86 |
| Pea cake | Java | 16·02 | ........ | 7·24 | ........ | ........ | 1·46 | 1·17 |
| Bean cake | North China | 14·52 | 80·32 | 6·77 | ........ | ........ | 1·33 | 1·99 |
| Rice husks | ........ | 42·74 | 42·15 | 1·07 | 13·77 | ·02 | ·03 | ·04 |
| Field pea, whole plant | ........ | 88·58 | 9·97 | ·55 | ........ | ·15 | ·12 | ·49 |
| Tares, whole plant | ........ | 83·97 | 14·96 | ·72 | ........ | ........ | ·11 | ·21 |
| Marsh mallow, whole plant | ........ | 79·00 | 17·86 | ·85 | ........ | ........ | ·14 | ·69 |
| Horse bean, leaves and stalks | ........ | 82·87 | 15·90 | ·90 | ........ | ·05 | ·11 | ·54 |
| Refuse from wheat cleaner | State Wheat Office, Pyrmont | 9·78 | 81·52 | 3·29 | 8·70 | ·4 | 1·18 | ·66 |
| Whale bones | ........ | 8·53 | 28·04 | 3·64 | ........ | ........ | 28·13 | ........ |

# Origin of the Name "Jerusalem Artichoke."

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S.

One would naturally expect that the Jerusalem artichoke (*Helianthus tuberosus*) came originally from, or had at least some connection with, the ancient city. The evidence—which provides quaint and interesting reading—is nevertheless to the contrary. In the *Gardener's Chronicle* for 23rd March, 1918, there appeared a paragraph offering prizes for a new English name for the vegetable, in which it was stated that "the name is considered a corruption of the Italian *Girasole artiocco* or sunflower artichoke, under which name it is said to have been originally distributed from the Farnese Gardens at Rome in 1617." This prompted C. C. Lacaita to investigate the history of the Jerusalem artichoke. The results of his researches were published in *Kew Bulletin* No. 9, 1919, and from that article the following brief notes are taken:—

Lacaita's investigations establish three points—that (1) the Jerusalem artichoke was not originally distributed from the Farnese Gardens; (2) it was not called *Girasole articiocco** in those gardens; and (3) it has never been known in Italy under that name. As far as can be traced, the Jerusalem artichoke was first noticed by Europeans during Champlain's second voyage (1604–7), who, while visiting the habitations of the natives at Nauset Harbour, on the coast of Massachusetts, on 21st July, 1605, saw it in cultivation. Its country of origin was ascertained in 1883, when Asa Gray named its birthplace as Canada, a determination confirmed and now generally accepted.

The earliest account of *H. tuberosus* is by Colonna in 1616, written after seeing it in the splendid garden of Cardinal Farnese in Rome; and to the fact that Colonna was the first botanist to speak of this artichoke must be traced the fallacy that the tubers were distributed throughout Europe from this source. In support of this theory there is not a tittle of evidence, says Lacaita. By 1616 the artichokes were already well known in Paris, and had probably been introduced there some nine years earlier. It seems likely that they were taken from Canada to France by Lescarbot in 1607. Probably introduced into England in 1617, the tubers were by that date well known in Paris and had acquired the name *topinambour*—their popular name throughout France to-day, and originally the French appellation of a Brazilian tribe, some natives of which happened to be a source of interest and amusement to Parisians at the time.

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* *Artiocco* is an obvious misprint.

Although there is evidence from correspondence that artichokes reached England from France in 1617, the first published reference to them is in 1622, when Venner refers to them in the following quaint passage:—" Artichoks of Jerusalem is a roote usually eaten with butter, vinegar, and pepper, by itselfe, or together with other meates. It is in nature somewhat answerable to the former (*i.e.*, artichoks), but not so pleasant in taste, nor of so commendable nourishment. It breedeth melancholy and is somewhat nauseous or fulsome to the stomache, and therefore very hurtful to the melancholick, and them that have weak stomackes."

Concerning the theory that "Jerusalem" is a corruption of the Italian *girasole* (according to Max Müller, from the Latin *gyrus*, turning to, and *sol*, the sun), which is now a popular as well as a book term in Italy for the sunflower *Helianthus annuus*, Lacaita contends that the statement that the artichoke was called *girasole* in Italy is incorrect. He states that every effort has failed to discover that the Italians called either the plant or its tubers by that name at or before the date when the vegetable came into use in England. He finds that the term *girasole* seems to have been first employed botanically for the castor oil plant, and that from evidence of literature of the day it seems as if the transference of the name from that plant to the sunflower may have taken place in England earlier than in Italy. The word *girasole* might easily have been applied by some scholarly gardener to the tuberous *Helianthus* when it made its appearance in England, and any unlettered hearer might most easily repeat the ill-caught sound as "Jerusalem."

## Two Types of Eureka Lemon.

Some years ago Mr. Harold Moore, Pennant Hills, visited California, and was so taken with the Eureka lemons there that he purchased some trees and had them forwarded to this State. A number of these trees were planted at the orchard of his brother, Mr. Bert Moore, "Sunnyside," Somersby. The latter now reports that they have proved a failure. The two original trees bear very little fruit, and what they bear is large and coarse. The Department also obtained two trees, and the experience with them at Yanco Experiment Farm was practically the same as at Somersby, namely, that the trees did not crop well, and the fruit was in every way inferior to the variety Sweet Rind.

There is a variety of lemon in this State which, though called Eureka, is very similar to Sweet Rind; in fact, I think it is synonymous with it. The Sweet Rind type can certainly be recommended, being even and smooth in texture; but growers cannot be recommended to plant the imported Eureka referred to above, notwithstanding that in California the variety so named carries good crops of summer fruit, and is being very largely planted in that State.—W. J. Allen.

# Chats about the Prickly Pear.

## No. 2.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist and Director, Botanic Gardens, Sydney.

### Its Minor Uses.

In order that the way may be cleared for the consideration of the major use of prickly pear—that is, as stock feed—the minor uses of the pest may first be indicated. The uses of prickly pear by various peoples are summarised by Dr. D. Griffiths, at p. 41 of Bulletin No. 74, U.S. Department of Agriculture, as follows :—

1. The fruits of not less than a dozen Mexican species are delicious, and would form a valuable addition to our fruit supply.

2. Very palatable jellies are manufactured from the fruits of some species, and could doubtless, under proper commercial methods, be put upon the market as choice delicacies, if the plants can be successfully grown in sufficient numbers.

3. The young joints are boiled for food as greens by the Mexican people.

4. The young joints are manufactured into pickles.

5. The young joints are chopped into small pieces and dried for future use.

6. The expressed juices are used by the Mexicans for mixing with whitewash for exterior work.

7. Many species are used for hedges, borders, fences, and other useful or ornamental plantings.

8. The pulp of the group of cacti known to the Mexicans by the name of *visnaga* [plants allied to the prickly pear—J.H.M.], is boiled with sugar in the manufacture of cactus candy.

9. The soft, pulpy tissues of cacti, being very retentive of moisture, are admirably adapted and extensively used for poultices.

10. Some species yield valuable [?—J.H.M.] drugs.

11. Before the development of the coal-tar dyes some of the species were largely used as hosts for the cochineal insect.

12. The peculiar reticulations of the vascular system of many species are taken advantage of in the manufacture of an endless variety of art goods.

The following minor uses may be briefly touched upon :—(1) The fruit as human food; (2) alcohol; (3) fibre; (4) mucilage (as a component of whitewash); (5) dye; (6) miscellaneous.

### 1.—The Fruit as Human Food.

We have two publications of an exhaustive character which deal with this subject, and show how important the fruits of some (not our pest pear) are in the dietary of the Mexicans. They are "The Tuna as a food for man," being Bulletin No. 64, New Mexico (U.S.) College of Agriculture, &c., by R. F. Hare and D. Griffiths (April, 1907), and "The Tuna as food for man," Bulletin No. 116, Bureau of Plant Industry, U.S. Department of Agriculture, by D. Griffiths (December, 1907).

These two works (particularly the latter) give a list of the fruits most esteemed for eating. In some cases the botanical name is uncertain. *Tuna Camuesa* (*Opuntia Larreyi*) is one of the best, and it is a member of the *Opuntia ficus-indica* group (see one of my previous articles, p. 50, *Gazette* of January, 1913). Dr. Griffiths says: "When the rind is removed, leaving the pulp intact, the latter has a distinct orange cast. When broken open it is mottled yellow and red, but becomes deeper red with full maturity." A coloured plate of *Tuna Camuesa* will be found facing page 56 of the American Bulletin No. 64, already referred to. There is a less exhaustive account of the use of the fruit as human food in Bulletin No. 78 of the New Mexico Agricultural College (E. O. Wootton, 1911).

If my article on *Opuntia ficus-indica* in this *Gazette* (January, 1913) be perused, it will be found that I give a good deal of information on edible fruits of prickly pear (some of them almost non-prickly). The fruit of the Velvety prickly pear (*O. tomentosa*)—see p. 1028 of my article of December, 1912—is also esteemed by some. I have known other naturalised species to have their fruits used for food in Australia; but these mentioned are the most important, and the *ficus-indica* is very much the more important. Yet it is only on rare occasions that it is seen in the shops. In 1899 Mr. J. B. Brown, of Windsor, told me that it was cultivated at South Kurrajong, and that the fruit brought half-a-crown a dozen in the market. Some years ago, however, the late Mr. T. Jessep, M.L.A., a well-known fruit-broker, told me that he had not seen it in the Sydney markets for many years. Occasionally I have seen it in the windows of the King-street (Sydney) shops, in common with other rare fruits, making a mute appeal to the connoisseur, but it could be supplied in great abundance if the public taste (which it is very difficult to control or direct) set in for it.

Speaking of prickly pear fruit in general, Dr. G. V. Perez, a well-known physician, wrote to me in 1913: "There is a prevalent belief in these islands (Canary Islands) on which the peasants lay great stress, and that is you must not drink wine when partaking largely of prickly pear, because it causes rectal obstruction; I have so many cases brought before my notice that I am inclined to think there is something in it. Our peasants, of course, partake very largely of them."

This statement may be compared with that quoted as Mexican experience in regard to *O. robusta*.

**2.—Alcohol.**

In Mexico, calonche, an intoxicating drink similar in taste to hard cider, is made from the fruit of several species of *Opuntia* by pressing out the juice, passing it through straw sieves, and heating it by fire or the sun, when it soon begins to ferment. (See Havard, *Bull. Torrey Bot. Club*, vol. xxiii, p. 33, and "Drink Plants of the North American Indians" in Sargent's "Silva of North America," vol. xiv.)

In Press Bulletin No. 121 of the New Mexico (a pear State) College of Agriculture, Mr. R. F. Hare, a well-known authority, writes (under date 24th December, 1906) on "Cactus as a source of industrial alcohol." He concludes with the following paragraphs :—

It may be that the fruits of the prickly pear will be found better suited to the manufacture of alcohol than the stems, if the yield per acre be found sufficiently large to warrant their production. We have fou: d that some varieties of this fruit contain 10 to 12 per cent. sugar, all of which is easily and readily converted into alcohol, without the previous malt or acid treatment necessary to produce alcohol from starchy substances.

It would therefore seem to us that, from our present knowledge of the subject, the manufacture of industrial alcohol from cactus can reasonably be considered within the range of possibilities.

Next in order of date in the papers before me is a paper circulated in the Australian press, purporting to record the work of Mr. K. M. Gibson, B.Sc., a Brisbane chemist; the Sydney *Daily Telegraph*, for example, has half a column in its issue of 11th February, 1908. This nebulous gentleman "sees in this despised plant commercial possibilities quite alluring, and calculated rather to encourage its cultivation rather than its ruthless destruction."

Mr. E. Harris (this *Gazette*, March, 1909, p. 237), in a thoughtful article urging that the uses of this plant be further inculcated, at p. 245 says: "The Brisbane chemist was unknown to the Department (of Agriculture, Queensland), and the Postal Department also failed to locate him." This is by no means the only occasion n which an untraceable person under an alias, or assuming a University degree, has amused himself by posing as a scientific man.

Following are some of "Mr. Gibson's" statements :—

"From experiments that I have carried out I have obtained from the prickly pear a white spirit in quality equal to the best obtainable in the Commonwealth, and sold in Brisbane at 32s. 6d. per gallon. The cost of production would not exceed 3s. 6d. per gallon."

A by-product of the spirit manufacture is "a most nutritious feed-cake for horses and cattle, at a cost not exceeding £3 10s. per ton. The present cost of feed-cake in this State is £7 10s. per ton."

"In the manufacture of paper an excellent strawboard can be obtained," and other statements are made concerning the valuable fibre to be obtained from prickly pear.

"Last, but not least, it makes an excellent sugar, equal to any sugar-cane grown in Queensland. The sugar properties contained under treatment of 2 tons of prickly pear are equal to 3 tons of sugar-cane."

This is the biggest practical joke, purporting to be scientific, that I remember in regard to plants in Australia for many years. We hear of pseudo-scientific reports as regards mines more frequently, but the mischief of this report is that it unsettled our people, while it found its way into journals in various parts of the world as sober fact, based on Australian experience. The prickly pear pest is quite serious enough without the complications that arise from the vagaries of the practical joker. The *British South African Export Gazette* of 2nd October, 1908, propagated this statement of the alleged Brisbane chemist in regard to the fibre paragraphs.

Next in order of date we come to Bulletin No. 72 (August, 1909), New Mexico College of Agriculture, entitled "Denatured Alcohol from Tunas and other sources," by Messrs. Hare, Mitchell and Bjerregoard. This is a specially valuable bulletin, and the most important contribution to the subject so far. The conclusions will be found at p. 51, and are only partly favourable to the enterprise in the United States (the home of prickly pears) of making alcohol from the fruits on a commercial scale.

I could quote other work and alleged work, but so far I cannot see much hope of prickly pear fruits being economically valuable as a source of industrial alcohol in Australia at the present time.

### 3.—Fibre.

The *Transvaal Agricultural Journal* for October, 1909, p. 67, refers to "Mr. Gibson's" statement in regard to the fibre, but information had been sought from the Imperial Institute which stated that the value of the fibre had been greatly overrated. In the bulletin of the Institute for 1910, p. 43, is a report on "Prickly Pear and its Utilization." At p. 44 the report of the supposed Brisbane chemist is referred to, and his exaggerated statements are mentioned under the further heads of alcohol and sugar.

Regarding the proposed utilization of the fibre it contains for paper making the results are discounted, partly because of the inherent inferiority of the fibre, and partly because of the high percentage of non-fibrous matter in the plant.

Under the headings "The Utilization of the Prickly Pear," *Agricultural News*, West Indies, 23rd July, 1910, p. 235, and "The Cactus Discounted," *Hawaiian Forester and Agriculturist*, Sept., 1910, p. 243, the discussion is continued. These are prickly pear countries.

Further information ("Report of the Queensland Prickly Pear Commission, 1914") has been acquired, and it supports the conclusion that prickly pear fibre cannot compete with other fibres in the market at present.

### 4.—Mucilage as a Component of Whitewash.

The use of prickly pear in making whitewash is frequently met with in the West Indies.

In regard to this matter, a note contained in *The Colonizer* for November, 1910, drawing attention to a similar employment of the prickly pear in Uruguay, is of some interest. It is stated that the white colour of the farm buildings in that State serves for special attraction, even during the wet season. The mode of employing the "leaves" is stated to be to slice them, macerate them in water for twenty-four hours, and then to add the lime and mix well. The endurance of whitewash thus made forms a matter for particular comment. (*West Indian Agricultural News*, 6th January, 1912, p. 8.)

The West Indian and Uruguayan practice is more or less followed in tropical countries where prickly pear is abundant.

**5.—Dye.**

Many of the species yield purplish fruits, the flesh being more or less intensely of that colour; the pest pear is a case in point. Although a good many authors refer to this colour, it has not, in these days of synthetic dyes, been found to have any commercial value. At the same time, it has some local or domestic use in the countries in which the species are indigenous.

**6.—Miscellaneous.**

In C. S. Sargent's "Silva of North America," vol. xiv, p. 13, will be found references to a local use of prickly-pear "leaves" for hardening tallow, for use as a poultice, &c. I have known the cool succulent substance to be used in New South Wales as a cooling agent in the treatment of whitlows, &c., also for black eyes.

In some countries, particularly India, prickly pears have been cultivated for hedges (in India even for fortifications), but this is a use which will appeal to no one in Australia. At this place a paper "The Destructive Distillation of Prickly Pear" by F. H. Campbell ("Rep. Aust. Assoc. Adv. Science," vol. x v, p. 104, 1913) should be consulted, although the products, tar, charcoal, &c., cannot be produced at a profit at present.

Although I am not too optimistic in regard to most of the minor uses enumerated, I am of opinion that some of the various products may help to reduce the cost of clearing pear-infested land, which should always be our aim.

## The Importance of Appearance in the Packing of Honey.

The nature of the bee-keeper's occupation, and his daily association with a régime unparalleled in nature for its perfect and delicate order, should make him particularly sensible of the importance of what are sometimes dismissed as "small things." One of these is the appearance of his honey containers.

It is very essential that the apiarist should study the outside appearance of his containers when preparing honey for market. Many apiarists use benzine tins, and these are satisfactory if they are carefully selected, properly cleaned with hot water and a small quantity of carbonate of soda, and then rinsed with cold water. Only the best and brightest tins should be used, and it is imperative, of course, that no slightest odour of benzine should be left in the tin.

When sending honey a distance by rail it is advisable to put the tins in crates. Where it is desired to consign uncrated, then personal attention should be given to the loading of the truck, so that the tins may be packed carefully, and in such a manner that no other produce is dumped roughly on top of them. Marketing with a poor appearance reduces both profits and sales.—W. A. Goodacre, Senior Apiary Inspector.

## Vineyard Notes for March.

The full extent of the damage to vines and consequent loss of crop due to mildew is now apparent in the County of Cumberland, and it can safely be said that it has cost growers many thousands of pounds. The regrettable feature of the whole thing is that proved remedial treatments were not availed of. There has been too great a tendency, despite all warnings, to treat the disease lightly and trust to luck.

There is probably no place in Cumberland where vines are so subject to mildew as the Viticultural Nursery at Narara, and if proof of the efficacy of Bordeaux mixture is needed this nursery amply affords it. Not only have the young nursery beds been successfully protected since early in December (when downy mildew first became apparent), but the collection of European varieties has retained luxuriant foliage and matured fine clean bunches of fruit. It is to be hoped that the experience of growers will have a salutary effect upon future operations, and that the advice of the Department of Agriculture will henceforth be accepted as conclusive. Although much good work has been done by the growers who sprayed their vines, there is probably not one who sprayed often enough to achieve immunity from injury. Such results as were obtained will, however, form an excellent guide for future action.

Vintage operations will be occupying the attention of vignerons in the wine areas, and it is gratifying to know that there has been an excellent recovery of the vines from the drought of the early summer. Although the yield will not be particulary heavy, it will be good under existing conditions, and the wines should be of a high order. High prices ruling for wines and grapes should constitute a sound inducement for extension.

There is every indication that demands will more than absorb the output of resistant grafts, and to any who desire to plant but cannot secure grafts, the question of planting rootlings for field grafting should be favourably considered. If growers would realise that this system of propagation, through the agency of the "Yema" bud graft, is superior to the bench graft, it would be to their advantage. If two vines, a graft and a rootling, are planted at the same time, and if the latter is budded in the following autumn, it will beat the graft both in growth and fruit bearing. The prejudice against the old method of field grafting is unfortunately levelled against this simpler and more effective practice. All assistance will be rendered by Departmental officers to any grower who would care to follow out this plan of re-establishing his vineyard. Pamphlets dealing with the method of procedure can be secured on application to the Department of Agriculture.—H. E. Laffer, Viticultural Expert.

## Essentials to Rural Contentment.

The farmer as well as the industrial worker is entitled to a living wage and a reasonable profit on his investment. He is entitled also to satisfactory educational opportunities for his children and to the benefits of modern medical science and sanitation. When these requirements are met there will be no difficulty in retaining in the rural districts a sufficient number of contented and efficient people. What we need is not back-to-the-land propaganda, but an acceleration of the work for the improvement of the countryside which will render the abandonment of farms unnecessary and the expansion of farming inevitable.—D. F. Houston, Secretary of Agriculture, Washington, U.S.A.

# Apricot Growing in New South Wales.

W. J. ALLEN.

THE apricot (*Armeniaca vulgaris*) is a native of Armenia, Arabia, and the higher regions of Central Asia. Its date of introduction into England is uncertain; but Parkinson, an old writer on fruit, mentions the introduction of the Algier apricot by John Trandescante, from Algiers, in 1620, thus showing that the fruit has been known in England for a considerable time. In England, however, the cultivation of the apricot is restricted to favourable localities; and though fruit of very high merit is grown, it is only on south walls and where it can be protected from spring frosts, as, on account of its early blossoming, it is very apt to be injured in exposed situations.

The uses of the apricot are many and varied; both in a fresh and preserved state, it is largely used as an article of diet, and a valuable oil is obtained from the kernels. As a fresh fruit for dessert it is decidedly the best of its season. It makes an excellent jam, cans well, and dries or evaporates well, keeping its flavour without deterioration, and, when properly cooked, coming out nearly equal in quality to newly-gathered fruit.

Of late years the apricot has to a great extent gone out of favour. This is not attributed to lack of popularity of the fruit, but more to the fact that, ripening about Christmas time, the fruit is very inconvenient to handle, as at that particular time labour is scarce and, if obtainable, very costly. It is advisable under these circumstances that a grower should not plant apricots in extensive areas, but should confine himself to a few select varieties and an area not larger than he can handle without depending too much on outside labour.

### Suitable Districts and Soils.

Except in the coldest parts of the State, the north-eastern seaboard, and parts of the arid interior where there is no water available for irrigation, the apricot grows well, but if the best results are to be obtained then suitable localities must be chosen.

The first essential in the soil is drainage, and if this is good, then apricots will grow in most soils, provided the trees are worked on suitable stocks. Though apricots will grow in a variety of soils, still they do very much better in some than others, and the soils that seem best suited for this fruit are fairly rich loams of medium texture—deep, friable, and possessing good natural drainage. They may be black, red, or chocolate in colour—varying according to districts. Sandy, loamy land or alluvial soils are not so good for apricots, as, though the trees planted in rich soils make a very heavy growth, they are usually not such good bearers, nor is the fruit of as good quality or as firm in texture as that grown on soils such as those described.

Very poor soils are also unsuitable for apricots, as trees grown under favourable conditions are heavy bearers and strong growers, and make a fairly heavy demand on the soil for potash, phosphoric acid and nitrogen, that for nitrogen being especially heavy.

### Propagation and Stocks.

Apricots are easily raised from the stone (pit) or by budding or grafting the desired variety on to a suitable stock. Either of these methods of propagation answers well, the wood of the apricot being by no means difficult to work. For budding, always choose plump, well-matured buds, see that they are cut thin, and that the stock is in good working order, viz., that the bark runs freely and does not require forcing. For working over old trees, budding is preferable to grafting; cut the head hard back, and bud on to the young shoots. The question of stocks for the apricot is one of considerable importance, as the success of the tree depends in no slight measure on the suitability of the stock as well as the soil.

It has also been found that when peach has been used as a stock for the apricot, the tree becomes liable to the attacks of aphis. It is not at all advisable to use any variety of plum as a stock for the apricot. This stock was for a time used to some extent in America, but in latter years it has been completely discarded.

Generally speaking, the most suitable stock is the seedling apricot. It is advisable in working young stock to only select vigorous plants. Of course, there are exceptions with regard to the selection of stocks, and it has been found in the County of Cumberland that the peach, which is generally used there, is fairly satisfactory.

### Site for the Orchard.

This is really a controversial question—a question of frost *versus* high winds. For instance, if an easterly aspect is selected, the north-westerly winds, which are the most prevalent, are certainly avoided, but, on the other hand, the rays of the sun are met directly it appears on the horizon. The damage attributed to frost is not actually caused by intense cold, but by the rapidity of thawing. Looking at the matter from this point of view, an easterly aspect is certainly a great disadvantage.

With a westerly aspect, the sun's rays will not strike the site until late in the morning, thus minimising the damaging effects of a sudden thaw, but as against this advantage, the site would be immediately exposed to our prevalent winds. The same objections apply in a greater measure to a north-westerly aspect. Taking everything into consideration, and having selected a site above the frost zone, an easterly aspect should be chosen; if, on the other hand, the site is in the frost zone, a westerly aspect should be selected.

The land should not be very steep, as owing to the high state of cultivation in which it is necessary to maintain it in order to retain the moisture, the soil is apt to wash badly during heavy rains; as there are often thunder showers

in the best apricot districts, it is also desirable to select land that will not wash to any extent. At the same time, the land should possess good moisture-retaining properties.

### Drainage.

As previously stated, thorough drainage is of the utmost importance in the culture of the apricot, and its absence is the cause of many of the diseases to which this fruit is subject. If the subsoil is of a heavy retentive nature that will prevent the free circulation of air or moisture round the roots of the tree, or if water lies on or stagnates in the soil, causing it to be sour and cold, or if there is a surplus of water in the soil from any other cause, then it is absolutely necessary to drain the soil before it is fit for apricot culture.

Apricot Orchard in Blossom at Wagga Experiment Farm.

Too many young orchards are set in undrained land. This class of land does not admit of proper tillage and plant food is not available; the soil is too cold in the spring, and bakes and is too warm in the summer, and it does not allow of proper air circulation.

### Preparation of the Land.

Clear the land well, taking out all stumps and roots to at least 20 inches from the surface. Plough as deep as you have soil, but do not bring the subsoil to the suraface. Plough the land well, turning it right over, and leave it as rough as possible, so that it is well exposed to the action of the sun, air and rain, as this will tend to sweeten the soil and make it more friable, and consequently easier to work. Plough the land some months before planting

the trees, and let it remain in a rough state; and if the subsoil is of a clayey, retentive nature, or if there is a hard-pan that will cause water to stagnate round the roots and prevent the roots from going down into the soil, then it is advisable to subsoil to as great a depth as the available power will enable and the roots in the soil will allow. Subsoiling will tend greatly to sweeten and aerate the land, and—what is of equal importance—will increase the natural capacity of the soil for retaining moisture during a dry time.

Do not hurry your land by planting the trees before it is in a fit state to receive them—rather lose a season. You cannot get the land into too good order for apricots, for, if thoroughly sweetened and friable and if there is no impervious subsoil to retain stagnant water, the trees will be healthy and free from "gum," which is often a cause of serious loss to apricot growers. There is thus every reason why care should be taken to prepare the land properly if the apricot orchard is to be a financial success.

### Selection of Trees and Planting.

In selecting trees, care should be taken to see that they are well grown and free from all disease; they should not be more than one year old. The hole for planting should have a depth of about 12 inches and a diameter of about 18 inches. In removing the soil care should be taken to put the surface soil on one side of the hole and the subsoil on the other; a small quantity of subsoil is then replaced so that it forms a pyramid in the centre of the hole. The roots of the young tree are next shortened back to within about 3 inches of the stock and all damaged roots removed, the tree being placed on the top of the pyramid and its roots spread evenly in all directions. All vigorous roots should be planted in the direction of the prevailing winds; this acts as an anchor to the tree. The remainder of the subsoil is finally filled in compactly and pressed down with the feet, the filling being continued with the surface soil until all the earth has been replaced. The trees should always be planted very firmly so as to exclude all air and the tops cut back to a height of about 18 inches from the ground.

### Cultivation.

Thorough cultivation is the only means by which apricot growing can be made a financial success in the districts best suited for the growth of the choice canning and drying varieties. The quality and size of the fruit and the amount of the crop depend more on it than on anything else—in brief, it is the one great essential, as it is only by means of it that we can conserve moisture in the soil during dry weather—a conservation on which the quality and quantity of the crop may depend. You cannot over-cultivate in a dry time, as the finer you get the soil the more perfect mulch it makes, and the longer it will retain moisture. Do not turn the soil; stir it, and stir it deeply. If you have a small orchard use a Planet Jr. with narrow teeth not more than 1¾ inches wide, and let them well down; but if you have a larger orchard with a loamy soil, then use a spring-tooth cultivator; for heavy soils use a fixed tine cultivator. After every rain cultivate the orchard as soon as you

can get on to the land, and get the cultivating done as rapidly as possible, as the sooner you get over the land and break the crust the more moisture you will save; land on which a crust is allowed to remain for any length of time loses moisture very rapidly by surface evaporation. Plough the orchard in the autumn after the removal of the fruit, even if the soil turns up in lumps and costs a considerable amount in shares; there is the advantage (in dry districts) of retaining the winter rains. Cultivate during the summer, always have your land in order, and never be caught napping, as a week's neglect at a critical time will sometimes mean the loss of a crop. Always keep the land free from weeds and in good tilth; it will then absorb any rain that falls, and this again is retained by cultivation, whereas on unworked land, a large part of the rain that falls is usually lost by running off the surface, and the little that does happen to soak in is rapidly dried out again by the sun and wind.

### Irrigating.

Owing to the paucity and uncertainty of the rainfall, irrigation is essential for the growth of apricots in the dry western country. Irrigation does not mean an unlimited supply of water whenever it pleases the fancy of the grower to turn it on, but a judicious supply of a moderate quantity of water at the right time. The mere watering of the land is of little value by itself; it is from the combination of irrigation and cultivation that the best results are obtained—too much water is often as bad as too little. Before irrigating the land be sure that the surplus water has a get-away—that is to say, see that the land has very good sub-drainage, as if this is deficient the water is very apt to lodge round the roots of the trees and do more harm than good. If there is no winter rainfall, then a thorough irrigation equal to a rainfall of 2 to 3 inches is essential, and this irrigation should be given before the buds burst or just when the sap begins to move, which is fully a month before the buds burst. A good watering then will carry the trees on to the time the stones are forming, when a second watering should be given; this watering will generally be sufficient to mature the crop, but if not, a third irrigation may be given. After each irrigation the land should be cultivated as soon as horses can be brought on to the land without any danger of their packing the soil, as this cultivation will tend to prevent surface evaporation, and if continued as described under the heading of "Cultivation," will retain the moisture in the soil till the next watering is required. Irrigation is best carried out by means of furrows, which are easily made with a furrowing plough or cultivator, and these furrows should be broken up after each irrigation. Have the furrows on each side of the row of trees, and, if the land is good irrigating land, at about 2 to 3 feet from the trees on either side, as the water will saturate the soil on each side of the furrow and thus cover he whole of the land. If the water will not soak so far then make the furrows nearer together. The number of furrows will depend on the soil, the age of the trees, and the distance between the trees. Flooding must be avoided.

### Varieties.

The varieties to be used for the purpose of canning, jam-making, or drying should be freestone, firm in texture, yellow in colour, evenly ripened on both sides, and with flesh juicy and sweet. Some of the French varieties (such as Luizet) are attractive, being large and having a red cheek, but these are generally shy bearers and lack the qualities mentioned above. The qualities desired are mostly found in the old English and American, and in some seedlings from those varieties.

One of the varieties known in Australia as Trevatt has proved itself of great value. This variety, although not of the highest quality, may be safely recommended to our growers as being a consistent bearer, vigorous, and immune to a great extent from disease. It is suitable for canning, jam-making and dessert, and is of fair quality when dried.

The following are English varieties arranged in order of ripening :—

| Name. | Size. | Quality. |
|---|---|---|
| Newcastle ... ... ... | Small ... ... ... | Indifferent. |
| Oullin's Early ... ... | Medium ... ... ... | Medium. |
| Trevatt ... ... ... | Medium ... ... ... | Medium. |
| Kaisha ... ... ... | Medium ... ... ... | Good. |
| Alsace ... ... ... | Large ... ... ... | Good. |
| Hemskirke ... ... ... | Large ... ... ... | Good. |
| Moorpark ... ... ... | Medium ... ... ... | Good. |
| Mansfield Seedling... ... | Large ... ... ... | Good. |

French varieties :—

| | | |
|---|---|---|
| Large Early.. ... ... | Large (very shy bearer) ... | Medium. |
| Luizet ... ... ... | Medium (shy bearer) ... | Medium. |
| Alberge de Montgamet ... | Medium ,, ,, ... | Medium. |
| St. Ambroise ... ... | Medium ... ... ... | Indifferent. |

### The Effect of Frost on Blossoming.

During blossoming and just after the fruit is set is a very critical period with most fruit trees, and with the apricot in particular. With a view to gathering data concerning the sensibilities of the apricot at these stages, collections of the fruit (many varieties growing under similar and under different conditions) have been tested on the Government orchards for many years.

There is no doubt that frost is responsible for heavy losses to fruitgrowers generally. Many methods have been attempted to cope with its effect, but up to the present nothing has proved satisfactory. We learn from California that the ravages of frost are greatly minimised there by the use of fire pots.

### Thinning Apricots.

There are two ways by which the fruit can be thinned. The first is to prune the tree in such a manner that no more fruit-wood is left than is sufficient to produce the quantity of fruit that the tree is able to grow to perfection. The second way is to thin by hand as soon as the last drop is

over—that is, after the drop which occurs when the stone is forming. Sometimes this drop is sufficient thinning in itself, in which case it is not necessary to thin further; but if too large a quantity of fruit has set, then it must be thinned. No hard-and-fast rules can be laid down for thinning apricots, the quantity to be left depending on the soil, climate, and the vigour of the tree. In some cases at least three-quarters of the fruit must be removed, and even then the tree will have as many fruits left as it can mature properly; whereas in other cases only a very slight thinning, or none at all, is necessary. The more vigorous the tree and the better the soil, the more fruit it is able to mature. The fruit-grower must use his own judgment in the matter, and if he is an observant man he will soon learn how much fruit the tree is capable of producing properly, and when and how much a tree requires to be thinned.

In thinning, gather the fruit; do not knock it off with poles. Pull off all the smallest fruit, and thin evenly all over the tree, not all on one side and none on the other. The strain on the tree's energies is very much reduced by thinning, and the quantity of plant-food removed from the soil by the crop is very much lessened. It takes much more out of the land to form the stone than it does to form the fleshy portion of the fruit, because the kernel of stone-fruits always makes a heavy call on the soil for phosphoric acid and nitrogen—the two principal plant-foods that have to be kept up in the soil by manuring. The extra prices obtained will more than pay for the expense of thinning.

### Gathering the Fruit.

The purpose to which the fruit is to be devoted determines the stage of ripeness at which it should be gathered. When required for drying it should be allowed to become thoroughly ripe, but not dead ripe or mushy, as then it will not keep its shape when cut; on the other hand, if gathered too green the fruit will dry light and be acid, as the sugar is not fully developed. For canning, the fruit must be gathered whilst still firm, just before the softening takes place, or it will not keep its shape whilst cooking; and for shipping long distances or for pulping it must be gathered even sooner. Gather the fruit carefully and do not bruise it any more than you can help; use step-ladders and do not get into the tree if you can avoid it, as if you do you destroy numbers of fruit-spurs along the main branches or just where the tree can bear most fruit without injury. Some Californian fruit-growers advocate shaking the fruit off into large sheets in a similar manner to prunes, but it bruises the fruit too much. It works well with prunes, which have a tough skin, but it spoils a number of apricots, and the extra expense of picking is made good by the extra value of the fruit. When gathered for drying, the fruit should be carried in the picking boxes direct to the cutting tables, so that there is as little handling as possible; and where the cannery is close to the orchard, the same method should be adopted. For sending long distances, or even to the local markets, the fruit should always be evenly graded and packed.

# The Compositions of Various Lead Arsenates.

A. A. RAMSAY, Principal Assistant Chemist.

An examination has been made of such brands of arsenate of lead as were procurable on the market in September, 1919, and the results are set forth in the accompanying table. Nine samples in all were examined, four of these being in "paste" form, and five as "dry powder." Of the paste forms examined, it will be noted that the moisture content ranged from 34·7 to 47·1, the arsenic acid content from 13·9 to 19·6, and the lead oxide content from 33·9 to 39·5 per cent. Of the dry powder forms examined, the moisture content ranged from 0·2 to 0·8, the arsenic acid from 26 to 29·5, and the lead oxide from 60·5 to 65·3 per cent.

This range in the amounts of lead oxide and arsenic acid present is due to the different forms and combination of the lead oxide and the arsenic acid; that is to say, to the different amounts of diplumbic arsenate and triplumbic arsenate present.

Arsenate of lead, as sold, consists essentially of diplumbic arsenate, triplumbic arsenate, or a mixture of both.

The compound diplumbic arsenate consists of two molecules or parts of lead oxide (the weight of which is represented by 445) united with one molecule or part of arsenic acid (the weight of which is represented by 230), and united with one molecule or part of water (the weight of which is represented by 18).

This compound, therefore, contains in every 100 parts 64·21 parts lead oxide and 33·19 parts arsenic acid. If this compound were made into a paste formed from 50 parts powder and 50 parts water, the paste would contain 32·11 parts lead oxide and 16·59 parts arsenic acid in every 100 parts of the paste.

This compound is sometimes called "acid arsenate of lead," and the term used indicates in chemical nomenclature the type of compound. The term "neutral arsenate of lead" is applied to that compound which contains three parts of lead oxide united to one part arsenic acid, since this is the maximum amount of lead oxide possible in the combination.

The compound triplumbic arsenate consists, as stated above, of three parts lead oxide (the weight of which is represented by 667·5) united to o e part arsenic acid (the weight of which is represented by 230). This compound, therefore, contains in every 100 parts 74·37 parts lead oxide and 25·63 parts arsenic oxide. If pure triplumbic arsenate were formed into a paste, using equal parts of the powder and water, the paste would contain 37·19 parts lead oxide and 12·81 parts arsenic acid per cent.

Perhaps the nature of these two compounds will be better understood if the analogy existing between phosphates and arsenates is referred to. In the former the calcium phosphates are widely known. There are three of them, viz. :—

(*a*) 1 *part calcium oxide with* 1 *part phosphoric acid*, forming mono-calcium dihydrogen phosphate, acid calcium phosphate, or superphosphate.

(*b*) 2 *parts calcium oxide with* 1 *part phosphoric acid*, forming dicalcic phosphate or dicalcium monohydrogen phosphate, or basic calcium phosphate.

(*c*) 3 *parts calcium oxide with* 1 *part phosphoric acid*, forming tricalcic phosphate, neutral phosphate, or rock phosphate.

Referring now to arsenates, and with special reference to lead arsenates, the compound analogous to (*a*) is not known to exist.

Diplumbic arsenate, however, exists, and corresponds to (*b*), while triplumbic arsenate corresponds to (*c*).

The amounts of di- and triplumbic arsenates present in the various samples are given in the attached table. It was considered that the fineness of division of the particles in the samples of lead arsenate purchased might have a bearing on the rate of settling out when suspended, as in applying them for spraying. An attempt has been made to separate the particles into two sizes—"impalpable," or those of about ·005 mm. diameter, approximating "clay" particles in size; and "not impalpable," or particles over ·005 mm. diameter and under ·01 mm. On referring to the table under the heading "mechanical analysis," it will be noted that although in three cases out of four the arsenates in paste form contain the largest proportion of their particles in an impalpable form, this is not so in all cases, because we have one case (No. 5, dry powder) where the percentage of impalpable matter is higher than it is in one of the paste forms (No. 3). Arranged in the order of greatest amount of impalpable matter, or smallest amount of coarser particles, we would have :—No. 6 (paste), No. 9 (paste), No. 4 (paste), No. 5 (dry), No. 3 (paste), No. 1 (dry) No. 8 (dry), No. 2 (dry), No. 7 (dry).

It will be noted that those brands of lead arsenate examined naturally group themselves under three classes, viz. :—

(A) Those in which the diplumbic salt predominates, viz., Nos. 9, 2, 1, 3, arranged in the order of largest content of diplumbic arsenate. The ratios of diplumbic arsenate to triplumbic arsenate in the above are respectively 7·9 to 1, 5·7 to 1, 4·6 to 1, and 3·5 to 1.

(B) Those in which there is nearly an equal quantity of di- and triplumbic arsenate, viz., Nos. 7 and 8. The ratio of diplumbic arsenate to triplumbic arsenate is 1·0 to 1 in No. 7, and 1·3 to 1 in No. 8.

(C) Those in which the triplumbic arsenate present is greater than the diplumbic arsenate, viz., Nos. 6, 5, and 4. The ratio of diplumbic arsenate to triplumbic arsenate in Nos. 6, 5, and 4 is 0·9 to 1, 0·8 to 1, and 0·5 to 1 respectively.

The difference which appears to exist in the physical condition of the lead arsenates examined is shown not only by a variation in the size of the particles, but also by the weight of a given volume of the lead arsenate, or, in other words, by the apparent specific gravity, which is recorded in the table under the heading "weight per 100 c.c." The variation in weight ranges from 36 in No. 8 to 123 in No. 7. Nos. 8 and 5 are the lightest (36 and 47), Nos. 7 and 4 are the heaviest (123 and 119), whilst Nos. 2, 6, 1, 3, and 9 are intermediate, being 83, 88, 91, 97, and 112 respectively.

The time that a lead arsenate will remain in suspension is a point worthy of consideration. Other things being equal, any lead arsenate that separated out immediately would be inferior for spraying to one in which the lead arsenate remained in suspension.

EXAMINATION of Various Lead Arsenates obtainable in Sydney, September, 1919.

| Brand. | Laboratory No. | Chemical Analysis of Sample as received. | | | | Mechanical Analysis. Size of particles. | | Probable Lead Arsenates present (calculated). | | Percentage of Di- & Tri-Arsenates in total Arsenates present. | | 100 lb. contains — pounds Dry Lead Arsenate. | Weight of 100 c.c. in grams. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Moisture. | Lead Oxide. | Arsenic Acid. | Not determined. | Impalpable. ('005 mm.) | Not impalpable. (about '01 mm.) | Diplumbic Arsenate. | Triplumbic Arsenate. | Diplumbic Arsenate. | Triplumbic Arsenate. | | |
| | | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent. | per cent | per cent. | per cent. | lb. | |
| Electro .. .. | 1 | 0·82 | 60·77 | 29·30 | 9·11 | 90·64 | 9·36 | 75·56 | 16·47 | 82·10 | 17·90 | 92·03 | 90·9 |
| Lewis Berger .. | 2 | 0·65 | 60·46 | 29·49 | 9·40 | 84·16 | 15·84 | 78·25 | 13·73 | 85·07 | 14·93 | 91·98 | 82·9 |
| Blyth's Blue Bell | 3 | 45·44 | 34·39 | 16·30 | 3·87 | 91·01 | 8·99 | 40·22 | 11·51 | 77·75 | 22·25 | 51·73 | 97·2 (dry powder). |
| Swift's .. .. | 4 | 45·59 | 34·66 | 13·85 | 5·90 | 97·91 | 2·09 | 17·24 | 31·72 | 35·21 | 64·79 | 48·96 | 118·5 (dry powder). |
| Orchard .. .. | 5 | 0·36 | 62·67 | 25·98 | 10·99 | 94·80 | 5·20 | 38·87 | 50·03 | 43·72 | 56·28 | 88·90 | 47·4 |
| Vallo .. .. | 6 | 47·08 | 33·90 | 14·19 | 4·83 | 99·44 | 0·56 | 22·69 | 25·99 | 46·61 | 53·39 | 48·68 | 88·3 (dry powder). |
| Green Cross .. | 7 | 0·21 | 65·29 | 27·77 | 6·73 | 83·60 | 16·40 | 47·67 | 46·63 | 50·55 | 49·45 | 94·30 | 123·1 |
| Rodgers .. .. | 8 | 0·81 | 64·19 | 27·88 | 7·12 | 84·73 | 15·27 | 52·09 | 41·33 | 55·76 | 44·24 | 93·43 | 35·9 |
| Carlton .. .. | 9 | 34·65 | 39·53 | 19·56 | 6·26 | 98·48 | 1·52 | 53·69 | 6·79 | 88·77 | 11·23 | 60·48 | 112·0 (dry powder). |

In the accompanying diagram the rate and amount of the settlement which takes place is represented graphically. The various lead arsenates were used at the strength recommended in *Farmers' Bulletin*, No. 72, viz., "18 oz. dry lead arsenate to 50 gallons water." The procedure was as follows:—The lead arsenate under examination was accurately weighed off, and intimately mixed with a small quantity of water, and afterwards diluted with water to the above standard. The whole was well shaken and poured into a vessel with sloping sides, and the time and the volume of the lead arsenate which fell in that interval of time recorded. From the data obtained the graph has been constructed.

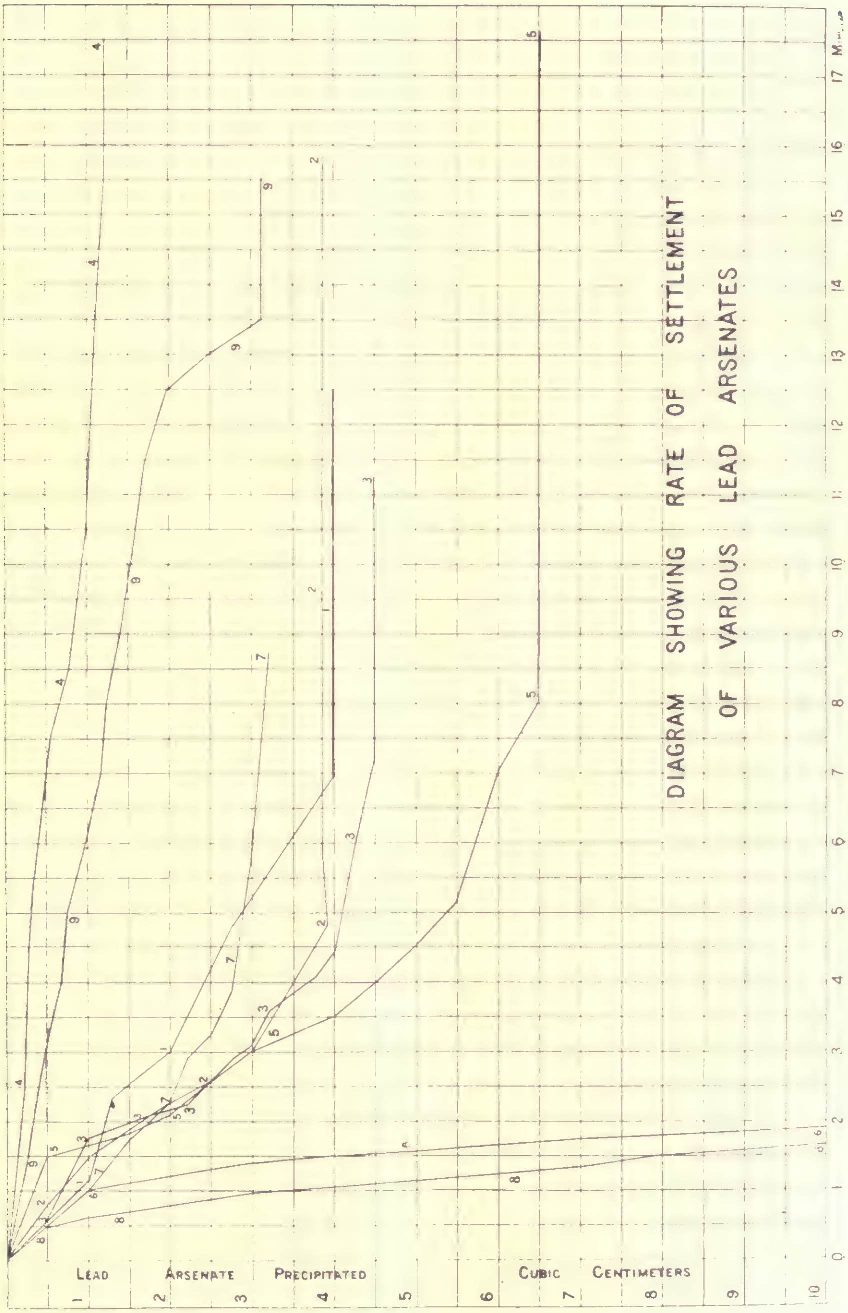
DIAGRAM SHOWING RATE OF SETTLEMENT
OF VARIOUS LEAD ARSENATES
LEAD ARSENATE PRECIPITATED CUBIC CENTIMETERS
1 2 3 4 5 6 7 8 9 10
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

On inspecting the graph it is at once seen that Nos. 6 and 8 separate out with great rapidity, and that the arsenate has fallen out of suspension in less than two minutes. The superiority of No. 4 is also immediately noted, and it will be observed that over a period of fifteen or seventeen minutes very little arsenate has settled out. The line of No. 9 indicates that it is very slightly inferior to No. 4, but that both are superior to all the others.

The graph further indicates that up to three or three and a half minutes there is very little difference in the rate of settlement of the others, viz., Nos. 1, 2, 3, 5 and 7, and consequently little to choose between them. At four minutes, however, No. 7 has practically settled, at five minutes Nos. 2 and 3 have practically settled, and at five and a half or six minutes Nos. 1 and 5 have practically settled. The graph, therefore, conclusively proves the superiority of No. 4 and No. 9 over all other preparations so far as rate of settlement is concerned.

## Apiary Notes for March.

There has been a gradual improvement during the past month in the conditions for bees, and apiarists generally have been enabled to build up their weaker colonies and in many cases to extract some surplus. Every endeavour should now be made to have the colonies prepared so that they will go into winter in the best and most populous state; this month is generally favourable for brood raising, and every encouragement should be given to the queen, so as to make the best of the remaining time. The brood nest should contain select worker combs suitable for breeding purposes, while the queen should be a good layer, and any old queens should be replaced by young ones. It pays to replace any queen that has completed her second season, for a good young queen in the spring will make a wonderful difference to the colony. The spring is the time the apiarist will now be looking forward to, for the losses caused by the recent abnormal conditions have to be made up again. The best way to prepare to do this is by wintering the colonies in good order, hived in good sound hives, with ample stores; then, with favourable spring conditions, the apiarist may be enabled to go in for artificial increase. Care should be taken this month when extracting to leave sufficient stores to carry the colonies over winter, and to allow for extensive brood-raising in the spring. One full super and what is naturally contained in the brood chamber can be taken as an estimate as to what quantity is required. The bees usually give an indication when a honey flow is going off by raiding any combs left out of a hive for a minute or so, or endeavouring to raid the extracting house during mild weather. Be careful and do not be mean during these times.—W. A. Goodacre, Senior Apiary Inspector.

During December, 1919, the plant *Echium plantagineum* (Paterson's Curse) was declared by the Upper Hunter Shire Council to be noxious within its area.

# Extracting Surplus Honey.

W. A. GOODACRE, Senior Apiary Inspector.

The term "extracting" is generally used to cover the combined processes of (1) removing combs from the hive, (2) uncapping the combs, and (3) extracting the honey by means of the honey extractor. There is no set period for extracting; there may be a honey flow fairly early in the season, while at times the apiarist will not extract any surplus until the autumn. Again, there are seasons in which the flow may last all through. A safe plan for the beginner who desires to know when to extract is, when the colonies are progressive and the super or supers nearly full of sealed stores, to place over the brood nest and under the supers a fresh super, the frames of which contain comb foundation or empty combs. When good progress has been made in this super, the apiarist can consider it is time to extract surplus from the sealed stores above.

The beginner should always keep in mind the fact that bees require a fair surplus of stores during early spring if they are to be progressive in brood raising; while in the late autumn ample stores should be left with the colonies to carry them safely over winter. Until experience is gained in regulating these matters, it is best for the beginner to keep a little on the safe side. The bees usually give an indication as to the supply of available nectar. For instance, if they are inclined to rush any combs left out of a hive for a minute or so, or endeavour to raid the extracting house to any extent during mild weather, the apiarist can be assured that there is a scarcity of nectar. The same can be said as regards a pollen shortage, when the bees endeavour to obtain a substitute by raiding the bran, pollard, or flour bins; but in this case the substitute is useless. I would advise the beginner to take notice of these indications, for even a practical apiarist is usually guided by them, especially in a new locality. Do not stint your bees during a dearth of nectar.

### Material for Extracting.

The materials desirable for the purpose of carrying out extracting operations in the yard are—a smoker, a hive tool, a bee-brush, and a wheelbarrow or small hand-cart, to the bottom of which a tin tray should be fitted to catch any drips from the combs.

The plant necessary in the extracting room for a small apiary consists of the following:—One simple cappings reducer, one oil stove or primus stove, two uncapping knives, one two-framed reversible honey extractor, and one or two 500-lb. capacity honey tanks.

Of course, when working on extensive lines the plant may be enlarged and added to. For instance, a Beuhne cappings reducer or a Geue reducer may be used; also larger honey tanks, a four or six frame extractor, and, if desired, a honey heater (used for the purpose of saving time—the honey, being artificially ripened, can be tinned off a few hours after extraction). All combs selected for extracting should be well sealed, for honey is not properly ripened until the bees have sealed it up in the combs. Inland, where the honey is dense, the apiarist can extract when the combs are about three parts sealed; but the beginner, especially in coastal districts, where the climate is damp, should have the honey well ripened by the bees themselves.

### Removing Surplus Honey from the Hive.

When about to remove the combs, the apiarist should have a number of super bodies that are interchangeable with the supers on the hives. As the frames are removed from the supers, shake the bees near the entrance and brush the remainder from the combs. There should be some convenience by which the young bees can crawl from the ground to the entrance. Some apiarists prefer to remove the supers in the first instance, and place over the brood nest an empty super, in which the bees are brushed from the combs Combs when being brushed or shaken should not be held too high from the ground or super.

In cases where several supers have been removed, an empty super should be put on the hive to allow accommodation for the bees. When sufficient supers containing combs to make up a load for the barrow or cart have been removed they can be taken to the extracting house. A number of colonies can be relieved of their stores before starting operations in the extracting room, if desired.

There are dozens of methods used in removing bees from the combs; for instance, in using the Bolton hive some prefer to remove the bees by dumping the super containing the frames on the ground. Others use a bee-escape board which is left on overnight. The bees get down below the supers and are thus prevented from getting back. When using a bee-escape, care should be taken to see that no brood is left in the supers above; otherwise it will be chilled.

Many prefer to have supers containing empty combs ready to put on the hive immediately the full ones are removed. This is a good method and very convenient, providing the apiarist is sure of freedom from brood disease; but the beginner should not practise interchanging combs when extracting.

### Work in the Extracting Room.

Hot water must first be poured into the reducer, the lamp (or primus stove) started, and the uncapping knives (which should be fairly sharp) put in their place in the reducer. Place the frame to be uncapped "end on" and resting on the board which is across the reducer. In using the knife work carefully; do not proceed with a cut when a comb begins to tear, and

for a start do not be afraid of using a fresh knife. After uncapping, the combs are placed in the extractor baskets—the beginner will learn by practice to regulate the pace when turning, so as to get the honey out without damage to the combs. New combs should be turned slower than older ones.

Often in the supers, combs will be found which contain patches of sealed brood. These can be extracted, provided the capping on the brood has not been interfered with, but any comb containing much larvæ should be left in the hive in the first instance.

After the combs are extracted they should be inspected, and the best breeding combs placed toward the centre of each super, for of late years apiarists generally favour the principle of allowing the queen to have the full run of the hive. It is found that by so doing and by having good combs in the supers, the queen will lay in some of the combs just after extraction, and then, as the brood emerges, and if that room is desired for storing purposes, the bees will force the queen down by filling the cells with honey.

### Replacing Supers after Extracting.

After having covered the supers to prevent robbing, they are taken to their respective hives. Remove the empty super from the colony and place it alongside the entrance. It will probably contain a good number of bees. Then put on the hive the extracted supers.

The bees in the empty super can be carefully dumped near the entrance. In the case where a few combs containing larvæ are left in the super, the apiarist can sufficiently dislodge the bees with a brush to allow the replacing of the full complement of combs without dumping the super, apart from the bees that adhere to the cover.

### Working with a System.

Where a fair number of colonies are kept, the apiarist should have matters regulated so that when one portion of the apiary is extracted the other colonies have a fair supply of stores. Where out apiaries are worked, the apiarist will be able to regulate his work so that each apiary will be ready for extracting in the convenient order. To enable this to be carried out, a good supply of prepared hives should be on hand. A practical apiarist with a good knowledge of his locality, can at times remove practically all the stores from the colonies at one time without a feeling of doubt, but such type of management is better left in the hands of the very competent.

### Inspection During Extraction.

When working under full pressure, the apiarist should make the best use of his time during extracting to put in order any colony that requires attention. A supply of frames containing foundation should always be on hand, so that unfavourable combs can be replaced by them. Supers should be put on any colony requiring extra accommodation, especially at out apiaries where swarming may not be noticed. In examination during extracting time the apiarist will get a good idea as to the state of his colonies.

### Hints on Extracting.

1. Leave one frame short in the supers, and space the remainder evenly so that you will get well-filled combs that are easy to uncap. This, when the combs are cut down to normal, will give fair wax production.

2. Have the material in the extracting room placed conveniently. If possible, have the extractor elevated so that the honey will gravitate to the tank direct; if the ground is on the incline, this can easily be carried out.

3. Do not interchange combs during extracting until you feel you are a competent judge of brood disease. Do not induce robbing by extracting in the open or leaving honey accessible to the bees, for disease is often spread in this manner.

4. Lengthen the life of your combs by careful handling, uncapping, and extracting. Learn to work quickly and yet do things right.

## A Dry Form of Lime-sulphur.

An interesting preparation under the name of "B.T.S." has been manufactured and sold as a dry form of lime-sulphur to be used in all cases where lime-sulphur spraying is desired. On examination the preparation appears to be barium tetra sulphide, and of about 88 per cent. purity.

It is recommended by the manufacturers that the powder be used at the rate of 12 to 14 lb. per 50 gallons water for spraying dormant trees, and at the rate of 1 to 4 lb. per 50 gallons water for trees in foliage. The former strength corresponds to 23·94 to 27·94 grams per 1,000 c.c., and the latter strength corresponds to 2·00 to 7·98 grams per 1,000 c.c.

Mixtures were made in the laboratory containing 26 grams per 1,000 c.c., and also 5 grams per 1,000 c.c. After shaking for the prescribed time with water, a chemical analysis was made of the two mixtures, and the following figures represent the results obtained, expressed as grams per 1,000 c.c.:—

| | 26 grams to 1,000 c.c. | 5 grams to 1,000 c.c. |
|---|---|---|
| Monosulphide sulphur ... ... ... | 4·046 | 0·432 |
| Thiosulphate ,, ... ... ... | 0·732 | 0·313 |
| Sulphate and sulphite sulphur ... | 0·068 | 0·025 |
| Polysulphide sulphur ... ... ... | 6·409 | 1·424 |
| Total Sulphur ... ... ... | 11·255 | 2·194 |

That decomposition has taken place in the more dilute solution is shown by the above figures, for had no decomposition taken place other than occurs in the 26 grams to 1,000 c.c. strength then the 5 grams to 1,000 c.c. mixture should have given the following figures:—

| | |
|---|---|
| Monosulphide sulphur .. ... ... ... ... | 0·578 |
| Thiosulphate ,, ... ... .. ... ... | 0·141 |
| Sulphate and sulphite sulphur .. ... ... ... | 0·013 |
| Polysulphide sulphur ... ... ... ... ... | 1·233 |
| Total Sulphur ... .. ... ... ... | 2·164 |

There is evidently greater decomposition in the weaker strength than in the higher strength, and it is also probable that the length of time the solutions are left standing might also affect the results obtained in spraying in the field.—A. A. Ramsay, Principal Assistant Chemist.

# Poultry Notes.

## March.

JAMES HADLINGTON, Poultry Expert.

NOTWITHSTANDING the cloud under which the poultry industry is temporarily labouring, and the severe testing time to which the poultry farmer is being subjected, we must still make plans for the immediate future. Stock may have to be reduced to a very low level, and many pullets and hens that might have been prospective paying units with feed at a medium or low price, may now become unprofitable. This will make severe thinning down an absolute necessity. Therefore, the main work of the poultry farmer for the present will be rigid culling of the non-producers. Unfortunately we have reached the time of the year when many potentially good producers will not be laying, but unless under stress of absolute necessity, these should not be sacrificed. This, of course, refers to hens that have completed, or are completing their first year's laying. In regard to those completing their second year's laying, that is, birds thirty months old, it is questionable if 10 per cent. of these will pay for their keep from this time onward.

In regard to the disposal of such hens, it is fortunate that a good many appear to be going into cold storage. Should this continue it will assist in staving off the slump that would otherwise occur for this class on the market. Light weight sorts must, however, be expected to suffer in price. It is only the heavier sorts that can make satisfactory prices, weight being a prime factor in hens to be stored.

### Culling Pullets.

This is one of the most difficult problems for even the experienced poultry farmer, because, notwithstanding all the rule-of-thumb systems that have from time to time been promulgated, experience proves that no uniform success in culling pullets can be attained until they have come well into lay. This fact accentuates the difficulty in regard to culling late-hatched pullets. Almost every poultry farmer of any standing has his own experience in respect to how his latest hatched pullets come on to lay, but the almost general experience is that the great bulk of pullets hatched and reared under ordinary poultry farm conditions after the middle of September do not lay many eggs before the following July. There are, of course, exceptions to this rule, but where that is so it will mostly be found due to having secured development that is above the average for this class.

Another fact the poultry farmer will do well to keep in mind is that these pullets are generally 25 per cent. worse layers during the whole of their lives than earlier hatched birds, even from the same parent stock. Here, then, is where culling is fairly safe at the present time.

It is evident that to carry stock with a prospective productiveness 25 per cent. lower than normal under present conditions will be to court failure. Unfortunately there are always too many birds of this class on our farms. It is useless to blame the writer for stating facts to which it is positively necessary that attention be called in the interests of the farmers and of the industry generally. If ever there was a time when it was necessary to stress this point, it is now. The existence of hundreds of persons in the industry depends upon the sound judgment brought to bear in handling their stock at this critical period. Mere numbers may lead to disaster, while judicious thinning out of low grade birds may enable many to see the difficult times through.

### New Stock.

It will readily be understood that at the present time breeders will neither have money to burn, nor an inclination to launch out freely in the purchase of new stock, but where such are necessary and it can be done, the introduction of birds that will keep up stamina and productiveness should not be neglected, and the time to get them is during the next few weeks.

## HOW TO POISON FOXES.

The depredations caused by the fox pest have become a very serious menace to poultry keeping, no less than to sheep farming.

The Hawkesbury Agricultural College has not been exempt from this trouble, and of late years it has assumed rather serious proportions. At this institution the trouble has been almost exclusively confined to the large colony enclosures used for the growing stock. These are situated on the bush side of the poultry section. Strange to say, the foxes have not troubled the new competition pens, doubtless owing to their small size, and perhaps to some extent because they have the appearance to them of so many traps. The constant tramping around these sections would also act to a certain extent as a deterrent. However, recognising the danger to the valuable stock kept at the College, and with a view to solving the problem for the farmer, Principal H. W. Potts has always been active in attempts to protect the live stock of the institution and to discover any more efficient method than those commonly in use. Almost every known method (including poisoning), and some new ones, have been tried, but with only limited success. Up to recently nothing had given such uniformly good results as dogs, chained to fencing wire stretched from one end of the ground to the other on each of three sides of the section of colony enclosures. Comparative immunity was obtained in this way for some time until some of the dogs became ineffective, and before they could be replaced by more suitable animals the foxes (having learnt to climb or otherwise negotiate the fences) reasserted themselves and losses again occurred amongst the young stock quartered in that portion of the farm.

**A New Method.**

The Principal instructed Mr. Lawrence, the Poultry Instructor, to again resort to poisoning. In the use of the poison every precaution was taken to avoid contact with the bait, it being well known that the scent of the human being is easily detected by foxes. Working upon this basis, the Instructor

Fig. 1.—One night's kill of Foxes at the College.

Fig. 2.—Sticks are used to place the poison in the bait

Fig. 3.—Throwing the bait off the trail.

conceived the idea of carrying the principle farther, and he endeavoured to put as much distance as possible between the baits and the tracks of the persons manipulating them. This he did by pointing a stout stick, inserting it into the poisoned bait and throwing it as far away as possible.

The result was highly successful. The first night seven baits were laid in this way, at a distance of some three hundred yards from the fences, birds killed on the previous nights being used as baits. The next morning nine foxes, as shown in Fig. 1 of the illustrations, were found dead in close proximity to the poisoned baits.

Fig. 2 shows the method by which the poison was inserted into the bait. The poison used was white soluble strychnine. This was inserted in an incision made in the neck of the birds just below the crop, and in the manner shown in the illustration. Two pointed sticks were used to place the poison in the incision.

Fig. 3 shows the operator throwing the bait away from the end of the pointed stick already mentioned.

In addition to the nine foxes shown in Fig. 1, three others were poisoned on the following night in exactly the same way, making, in all, a dozen in two nights. Apparently the whole pack that was visiting the yards was thus wiped out.

## Annual Stud Pig Sale at Hawkesbury Agricultural College.

The Annual Stud Pig Sale at Hawkesbury Agricultural College will be held on Wednesday, 24th March, at 12·30 p.m., when fifty specially selected pedigreed pigs (including Berkshires, Tamworths, Middle Yorkshires and Poland Chinas) will be offered at auction.

A train is timed to leave Central Station, Sydney, for Richmond at 8·55 a.m., and vehicles will meet the train and convey buyers to the sale. Luncheon will be provided at the College, and buyers can return to the city by 6 p.m. on the same day.

Arrangements can be made for crating and despatching the animals, and the vendors will feed and attend to same pending despatch.

Catalogues and further particulars can be obtained from Messrs. Badgery Bros. (auctioneers), the Principal of the College, or the Under Secretary and Director, Department of Agriculture, Sydney.

## The Maintenance of Fertility.

A crop of 30 bushels of wheat removes from the acre on which it is grown 33 lb. of nitrogen, 14 lb. of phosphoric acid, and 9½ lb. of potash; whilst a crop of 22 tons of mangolds removes 87 lb. of nitrogen, 34 lb. of phosphoric acid, and 223 lb. of potash. If, then, mangolds were sold, what a huge loss in fertility the farm in general would sustain.

Potatoes, again, are a crop that are invariably sold off the farm. Now, 6 tons of potatoes, an average yield of an acre, remove 47 lb. of nitrogen, 21½ lb. of phosphoric acid, and 76½ lb. of potash.

These examples show plainly enough that a crop is exhaustive or not, according as it is or is not sold off the farm.—W. R. Liston, in the *Agricultural Gazette* (England).

# Orchard Notes.

## March.

W. J. ALLEN and S. A. HOGG.

### Preparing Land for Planting.

If intending planters have not already prepared their land, no time should be lost in doing so. It is always advisable to have the land ready some considerable time before planting. Such work as clearing, grubbing, ploughing and subsoiling should be carried out very thoroughly. In some districts, particularly near the coast, the fungus disease known as *Armillaria mellea* attacks many of the roots of our native trees, and if allowed to remain in the soil young citrus trees which may be planted subsequently are likely to suffer. Autumn has been found very suitable for planting citrus trees in our coastal districts, but in the case of low-lying frosty situations it has been found that spring is preferable.

### Harvesting.

During this month the picking, packing and marketing of fruit will be general. Such fruits as raisin grapes and sultanas should be ripe at the end of the month, but care must be taken not to pick them until the berries have obtained their full maximum of sugar. Prunes also will be ready for picking and processing, and in many places apples and pears should be picked and despatched to market or for cold storage. In the case of apples and pears —particularly the former—a certain proportion of fruit will be unsuitable for market but may be profitably utilised if converted into pulp. This requires an outfit, which, it is understood, can be procured at a small cost from some of the leading merchants in Sydney. Where pulping is not practicable, the fruit may be dried, but in this case a small evaporator will be required.

### Grading and Packing Fruit.

The necessity of grading and packing fresh fruit as well as dried fruit cannot be emphasised too frequently. The fresh fruit should be picked early in the morning, if possible, when the fruit is cool but dry; should it be damp it must be allowed to dry before packing. The cases should be lined with clean paper, and in the case of high grade apples, pears, peaches, nectarines, lemons, or oranges it is preferable to wrap them individually. The cases should be packed to their utmost capacity, care being taken to avoid putting more in a case than will allow of the lid being firmly pressed down to keep in contact with the fruit and so prevent it moving during transit.

In packing grapes at least 24 lb. should be packed in a grape case (half bushel). The attention of the Department was lately drawn to an instance where such packing to capacity was neglected. A certain grower forwarded

a number of half cases only containing about 12 lb. of grapes each. These arrived in very bad condition and proved difficult to dispose of at barely 3s. On the other hand, another consignment received at the same time, but well packed and in good condition, was easily disposed of at 12s. 6d. per case (half bushel).

### Strawberries.

Strawberry culture has not advanced in this State to the position it deserves. Under favourable conditions strawberry growing is very profitable, and an activity in which juvenile labour can be used to advantage. It has been found that planting in the autumn in our coastal districts has its advantages. Before planting, the runners should be removed and the roots shortened to at least one-third of their length.

### Cultivation of Orchards.

In the drier districts it is strongly recommended that ploughing should be commenced as early as possible. The land should be left in a rough state so as to absorb the winter rains. During August and September the land should be well cultivated, and if it becomes consolidated by traffic should be ploughed to a depth of several inches and kept thoroughly cultivated during the growing months.

### Cover Crops.

Where the rainfall is sufficient it may be found a good practice to grow a cover crop between the rows of trees for the purpose of being ploughed under. The most suitable crops for this purpose are peas, rape, vetches, rye, and barley. It is advisable when sowing to also apply a dressing of superphosphate at the rate of about 60 lb. per acre. These crops should be ploughed in before they blossom. They should never be allowed to mature, as by doing so they rob the soil of the moisture which may be required for the development of the fruit, and thus defeat one of the purposes of using green manures.

## A Query from California.

"Can you tell me where I can get what is called 'Australian bees,'" ran a query hastily pencilled in California and lightly addressed "Postmaster, Sydney, Australia," but which the "Postmaster" genially referred to the Department of Agriculture. "It is put into a jar with water and sugar or molasses, and ferments."

The Biologist confessed a casual acquaintance with the subject:—"I had a specimen with the above appellation forwarded to me for examination from America some time ago. It was stated that it was used for making a beverage by placing some in a jar of dilute sugar solution, that the beverage was ready after a few days, and that on drinking it a feeling of warmth and satisfaction resulted. The examination of the specimen proved it to be a fairly pure culture of yeast."

Apparently Uncle Sam is already seeking consolations, but why connect the fair name of Australia with them?

# Agricultural Bureau of New South Wales.

### Suggested Subjects for Bureau Meetings.

**IT sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—**

*What was the most profitable undertaking on your farm the past year—not necessarily the undertaking that brought in the most money, but the one that, for the money invested and the labour involved, gave the best returns? Will you make this a permanent feature on your farm?*

*Have you observed any substantial difference as a result of treating seed wheat with bluestone solution? Many successful farmers have become convinced by their experience of the value of the treatment. Have you tried the method recommended by the Department, and how does it compare with any other method you have ever adopted?*

*The area affected by take-all is steadily increasing. Have you noticed whether rotation, fallowing or methods of cultivation have any influence upon its occurrence? Do they tend to limit its spread?*

*Do you practise autumn ploughing in the orchard? In districts of small rainfall it is likely to be useful in conserving the autumn and winter rains. Have you had any confirmation of this in your experience? In coastal districts frequent showers in the latter part of the summer prevent the control of weed growth. Have you tried autumn ploughing as a means of making use of these weeds to increase the humus content of the soil?*

*Have you ever sown crops of winter stock feed on maize land after the early crop is off? What effect have you noticed these crops (wheat, oats, rye, field peas, rape or vetches) to have on the subsequent crop?*

## REPORTS AND NOTICES FROM BRANCHES.

***NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.***

### Bimbaya.

A meeting was held on 18th December. General business was discussed, and the Inland Fisheries Officer gave valuable information regarding the acclimatisation of trout, &c., in local rivers.

At a meeting on 7th January a discussion took place on the roads of the district, and it was agreed to mention several of them to the local shire councils. The secretary was instructed to procure a copy of "Australia Unlimited" for addition to the library.

A useful discussion followed on the means by which the prosperity of the district could be best promoted. Better roads, sounder methods of agriculture, a larger public spirit, and a heartier support of local institutions all had their partisans in the matter.

### Blacktown.

The annual meeting was held on 14th December. It was agreed to co-operate with the Tingha branch in an endeavour to secure sufficient supplies of sugar for jam-making and fruit-preserving, and also to co-operate with the Cordeaux branch in endeavouring to secure from the Government ammunition for the purpose of destroying flying-foxes.

The second annual exhibition of the branch has been fixed for 7th and 8th May. A district exhibit will also be staged at the Hawkesbury Annual Show this year.

### Cotta Walla.

The annual meeting was held on 12th January, twenty-two members being present.

The election of officers resulted as follows:—Chairman, Mr. T. J. Kennedy; Vice-chairmen, Messrs. O. A. Storrier and J. C. Weatherspoon; Treasurer, Mr. J. Plumb; Hon. Secretary, Mr. T. A. Howard; Auditors, Messrs. W. Howard and C. Howard.

During the evening a paper was read by Mr. W. Howard on the subject of pig-raising. It was urged that every dairyman who keeps ten or twelve cows should keep a breeding sow. The paper raised one or two issues that led to useful discussion.

### Dural.

At the last meeting the following questions, which appeared in the January issue of the *Agricultural Gazette*, were discussed:—

1. What class of crop do you prefer for green manuring?—Members considered that in the Dural district Grey peas were preferable for green manuring. Rye and rape were not used. The best months for sowing were considered to be February and March. It was further thought that the rainfall in the district was generally so consistent that it was quite the exception to experience any difficulties from lack of moisture.

2. Have you been successful in the control of peach tip moth?—Members stated that so far their district had been comparatively free from peach tip moth, and that no material damage had resulted this season.

### Garra-Pinecliffe.

A meeting was held at Mr. H. Robard's residence on 8th February, Mr. Forrester in the chair.

After the usual business had been dealt with, the chairman and secretary were called upon to investigate the contents of the question box. The first piece of paper drawn was a clipping from a newspaper on the working of the divining rod, which was read by the secretary. The next was the question, "Which are the best varieties of wheat to grow in our district for wheat and hay?" The varieties voted as good were Yandilla King, Marshall's No. 3, and Cleveland. Another question asked was "Which is the best implement to use for working the land?" Members considered that for the present season the spring-tooth was the best implement, as the land had not settled down owing to the spring having been so dry.

### Glenorie.

A meeting was held on 27th December. General business was discussed, and a visit to Hawkesbury Agricultural College was projected.

At a subsequent meeting on 10th January, further business was transacted.

### Lidcombe.

This branch shows much activity, the meetings being well attended. On 15th and 29th December meetings were held at which show business was transacted. On 10th January the members visited Mr. H. J. Rumsey's property at Dundas, and had an instructive time. On 12th January a well-attended meeting was held, when a paper was read by Mr. Lawrence on vegetable culture. Hints were given on a formidable number of vegetables, special mention being made of the necessity for good methods of manuring, rotation of crops, and the preparation of the seed-beds.

### Lisarow.

A meeting was held on 6th December, twelve members being present. During the evening it was decided to compete at the Gosford Show for the district prizes.

On 3rd January a further meeting was held, when ten members were present, and arrangements were made for staging the exhibit. Discussion also took place on various railway and postal facilities that were required by the district.

### Lower Portland.

A meeting was held on 5th January, the attendance being somewhat restricted owing to inclement weather. The flying-fox pest was discussed.

### March.

A meeting was held on 19th January, eight members being present. After the general business had been dealt with, a useful and helpful paper on fruit packing by Mr. H. V. Howarth was read and discussed.

### Middle Dural.

A meeting was held on 9th January. The question of pool-buying was considered, and a discussion also took place on the experimental work being carried out in the district by the Department.

### Milbrulong.

A meeting was held on 5th January, when the sugar shortage and its effect on jam-making and fruit-preserving were discussed. It was decided to take steps to secure a sufficient quantity for local requirements.

A plot of 4 acres was offered by Messrs. Lynch Brothers, for the purpose of establishing experimental grass plots and accepted. A debate took place on the subject of wool or mutton for the farmer. A library has now been formed in connection with the branch.

### Miranda.

A ta meeting held on 17th November Mr. R. N. Makin, Inspector of Agriculture, gave an interesting and instructive lecture on the growing of legumes and other plants for the feeding of stock. The lecturer spoke at some length on the growing of lucerne, and showed the advantages derived from soil inoculation, explaining that if a patch of lucerne was not doing well, it might be greatly improved by spreading a small quantity of soil from a patch that was giving satisfaction, and harrowing it well in.

### Moss Vale.

The monthly meeting was held on 9th January, a good attendance being recorded. The programme for the coming year was fixed and arrangements were made for the branch making an exhibit at the Moss Vale Show.

### Quaker's Hill.

The members of this branch, at a meeting on 10th January, discussed several methods of creating increased interest amongst farmers. It was decided that, in addition to a vigorous canvass for new members, a series of competitions be held—one each meeting—and a general exhibition of produce, combined with a social evening, at a comparatively early date.

Samples of maize seed supplied by the Department have been divided amongst ten members, each of whom (on a pre-arranged date) will sow a small area, according to his own ideas of cultivation and manuring. Keen competition is expected. Small parcels of wheat and oats supplied by the Department last year were sown by members. All report indifferent results with the wheat, but in every case Sunrise oats did excellently.

A challenge is issued by the branch to any centre within the Blacktown shire to a competitive exhibit of produce at the first show to be held by the newly-formed Blacktown Agricultural Society.

### Stratford.

A meeting was held on 10th January, when fourteen members were present.

General business was followed by discussion of the question (taken from the *Agricultural Gazette*): "What method do you adopt in keeping your cream cool in order to produce choicest grade butter?"

Mr. Wenham expressed the opinion that cream should always be allowed to cool thoroughly before being mixed with other cream, and it should always be kept covered with mosquito net and covered around with wet bags. Mr. T. Germon favoured keeping cows away from stagnant water-holes, and the addition of a little coarse salt to the cream to keep down fermentation.

Mr. H. Perrin considered that each quantity of cream separated should be cooled separately and stood in tubs of water. He also believed in strict cleanliness throughout. By adoption of this method Mr. Perrin said he was able to produce all superfine butter for the year 1919.

Mr. E. Gresham said he cooled all cream by standing it in water and then mixing it in the can and stirring regularly. He favoured cows having access to running water, and thought that a large percentage of second-grade cream was due to cows grazing on swampy lands.

Mr. P. H. Deards believed in mixing cream in the can after it had cooled. Cans should always be wrapped in wet bags and all parts of the separator perfectly cleaned. By this method less than 3 per cent. of second-grade cream was produced.

### Toronto.

The annual meeting of this branch was held on 2nd December, when the retiring office-bearers were re-elected for the ensuing year. The report showed that the past year had been one of useful activity, several valuable papers having been read and officers of the Department having given lectures and demonstrations of most helpful kinds. Visits had been made to the properties of several members with profit. The balance-sheet showed a healthy credit balance to carry forward.

At the monthly meeting on 6th January Mr. Cockburn read a paper on woolly aphis, which he denominated the worst pest that orchardists have to contend with.

### Woonona.

The monthly meeting was held on 13th January, when there was a good attendance of members. Twenty-three new members were enrolled, making 139 members for four months.

The fourth annual show of the branch was held on 17th January, when an extensive collection of fruit and vegetables of the district, jams and preserves, flowers and pot plants, poultry and eggs, fancy and art work, and school work of all kinds was staged and attracted a large number of visitors. The exhibition was opened by Mr. W. Davies, M.L.A., who warmly congratulated the organisers on the completeness of the collection and the high standard of the exhibits. Mr. Davies' commendation was unanimously and heartily approved by all who attended, and the branch cannot but be strengthened by the success of the event.

A gardens competition, judged a few days before, created a great deal of interest and was a valuable feature.

### Yarramalong.

The annual meeting was held on 21st January, fifteen members being present.

It was decided to communicate with the Department of Agriculture in regard to a supply of wheat suitable for the growing of green fodder, and arrangements were made for a supply of Algerian oats.

The election of officers for the ensuing year resulted as follows:—Chairman, Mr. J. L. Ellis; Treasurer, Mr. J. Bailey; Hon. Secretary, Mr. E. Hodges.

A meeting was held on 5th February, when business in connection with the postal facilities in the neighbourhood was dealt with and arrangements were made in connection with the supply of seed wheat and oats for the coming season.

It was also unanimously decided that the branch should compete in the village exhibit at the forthcoming local show.

## Business-like Dairying.

The city business man will leave nothing undone to get the most from his business. He will work at his account books late in the night and early in the morning, and he will spend large sums in advertising in order to bring in greater returns; but there are very few farmers who will use a Babcock tester after dark to see what each cow is worth to them, or realise that to pay a reasonable price for a first-class dairy bull with which to breed better heifers is an investment that comparatively few farmers undertake. Plain business methods applied to dairy-farming is all that is required to make the returns therefrom fully satisfactory.—J. S. McFadzean, in *The Journal of Agriculture of Victoria.*

# AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Bellinger River A. Association | J. F. Reynolds | Mar. 3, 4 |
| Tumut A. Association | T. E. Wilkinson | ,, 3, 4 |
| Manning River A. and H. Association (Taree) | L. Plumer | ,, 4, 5 |
| Berrima District A., H., and I. Society | C. E. Wynne | ,, 4, 5, 6 |
| Wollongong A., H., and I. Association | W. J. Cochrane | ,, 4, 5, 6 |
| Nepean District A., H., and I. Society | C. J. Welch | ,, 5, 6 |
| Bangalow A. and I. Society | W. H. Reading | ,, 9, 10 |
| Glen Innes and New England P. & A. Association | G. A. Priest | ,, 9, 10, 11 |
| Mudgee A., P., H., and I. Association | E. J. Hannan | ,, 9, 10, 11 |
| Gundagai P. and A. Society | H. W. Simpson | ,, 10, 11 |
| Moruya A. and P. Society | H. P. Jeffery | ,, 10, 11 |
| Tumbarumba and Upper Murray P. and A. Society | E. C. Cunningham | ,, 10, 11 |
| Hunter River A. and H. Association (West Maitland) | E. H. Fountain | ,, 10, 11, 12, and 13. |
| Hastings District P., A., and H. Society | A. D. Suters | ,, 11, 12 |
| Queanbeyan P. and A. Association | J. G. Harris | ,, 16, 17 |
| Armidale and N.E. P., A., and H. Association | A. McArthur | ,, 16, 17, 18, and 19. |
| Cobargo A., P., and H. Society | T. Kennelly | ,, 17, 18 |
| Richmond River A., H., and P. Society | G. W. Raff | ,, 17, 18 |
| Macleay A., H., and I. Association | E. Weeks | ,, 17, 18, 19 |
| Camden A., H., and I. Society | A. E. Baldock | ,, 18, 19, 20 |
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| Campbelltown A. Society | J. T. D. Earl | ,, 23, 24 |
| Cooma P. and A. Association | C. J. Walmsley | ,, 24, 25 |
| Taralga A., P., and H. Association | J. J. Kearney | ,, 24, 25 |
| Upper Hunter P. and A. Association (Muswellbrook) | R. C. Sawkins | ,, 24, 25 |
| Walcha P. and A. Association | S. Hargrave | ,, 24, 25 |
| Royal Agricultural Society of N.S.W. | H. M. Somer | March 29 to April 7. |
| Batlow A. Society | C. S. Gregory | April 13, 14 |
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| Upper Manning A. and H. Association (Wingham) | D. Stewart | ,, 21, 22 |
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| Dungog A. and H. Association | W. H. Green | ,, 28, 29, 30 |
| Corowa P., A., and H. Society | J. D. Fraser | Aug. 17, 18 |
| Parkes P., A., and H Association | G. W. Seaborn | ,, 18, 19 |
| Murrumbidgee P. and A. Association (Wagga) | A. F. D. White | ,, 24, 25, 26 |
| Lockhart A. and P. Society | E. D. Arnold | ,, 31, and Sept. 1 |
| Albury and Border P., A., and H. Society | A. G. Young | Sept. 7, 8, 9 |
| Ganmain A. and P. Association | T. S. Henderson | ,, 14, 15 |
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| Holbrook P., A., and H. Society | J. S. Stewart | ,, 28, 29 |
| Deniliquin P. and A. Society | P. Fagan | ,, 29 |

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THE

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OF

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VOL. XXXI. PART 4. APRIL 3, 1920.

*Agricultural Gazette of New South Wales.*

# An Obscure Disease in Wheat.

J. T. PRIDHAM, Plant Breeder.

FOR many years we have noticed at Cowra and in other districts a condition in wheat crops which appears to be one of disease, though its specific nature has not yet been discovered. Specimens sent to Dr. Darnell-Smith showed spores of Erysiphe fungus but no signs of take-all. While the writer was resident in Victoria some years ago, specimens of this trouble were sent to Mr. McAlpine, who found no fungus of take-all present, and considered that the condition was due to an unfavourable state of the soil, physical or chemical.

Nothing abnormal is seen in the wheat plant until it is out in head, and the grain starting to form. As the straw and ear turn from green to the ripe state, some stalks have thin flat-sided ears, which have a faded, dull appearance, instead of the bright-tinted, bold condition of normal heads. When ripe, the grain is very thin and pinched; in extreme cases no grain is formed, but in these cases the head is not bleached white as in take-all, nor is there the blackening at the foot of the straw. Farmers have come to consider a proportion of such heads quite the usual thing, and variously attribute the condition to insects, frost, want of moisture, or bad patches of soil causing malnutrition. Each of these suggested causes has been considered, but each fails when tested. Last season white ants attacked the roots of the wheat, but we had not found them in previous years, and at Cowra no other insects have caused damage of this nature so far as we know.

The trouble has occurred in mild seasons with no severe frosts; and it has been found in outside plots bordering a path where the growth of adjacent healthy plants was more vigorous than usual, so that want of moisture and nourishment cannot be entertained as the cause. We have sown pinched grain from affected ears and have obtained a healthy plant bearing good grain, the seed not having been pickled or treated in any way. Observations for the last nine years at Cowra may be summarised thus :—

1911.—The prevalence of an obscure disease like take-all was noted.

1912.—A sprinkling of plants affected with this disease was found all through the plots. Some plants produced no grain, others were only partially affected.

1913.—In this year all the seed for the stud plots was treated with bluestone and limewater before sowing. In spite of this there was a large percentage of diseased plants throughout the plots.

1914.—The disease occurred in patches and was worst in loamy free-working soil; there was very little indeed on stiff red clay. All stages were

found; when partially affected it was the later stalks that suffered. In this season the loss was conservatively estimated at 5 per cent. It was much more prevalent in the early than in the later sowings.

1915.—Half of the area was treated with sulphate of iron at 56 lb. per acre, at a cost of 3s. 6d. There was very little of the trouble this year. The plots treated were examined and no disease found. In the untreated half, ten affected plants were counted. At the end of the season it was noted that there was a little disease throughout the plots, but the patches were larger and more frequent in the untreated area.


**The Effects of Disease on Heads of Major Wheat**

The pinched appearance of the outer heads compared with the inner ones illustrates the loss the disease occasions.

1916.—A good many partially-attacked plants were noticed throughout. Thew wheat was quite liable and no variety was exempt. Sulphate of iron was not used this year.

1917.—This season the whole area was top-dressed with 100 lb. sulphate of iron per acre a month before sowing. It was noted that a good deal of the trouble occurred in the early sowings.

1918.—No sulphate of iron used. The condition was again seen and counts were made of the thoroughly affected plants, which were then removed, those only slightly affected (one or two heads only) being neglected. Earliest ripening varieties were least affected, mid-season and late sorts suffered most, but none were immune. Some eighty-one varieties were under observation, totalling 6,746 plants. Of these, 725 were pulled up, giving 10 per cent. diseased plants in the plots examined.


**The Effects of Disease on Cowra No. 15.**

Note the pinched appearance of the two outside heads.

1919.—The trouble was not found. No sulphate of iron was used. The only weak and apparently diseased plants were attacked by white ants. This season was very dry, only 15·78 inches of rain for the year. The wheat was remarkably free from fungus diseases of all kinds; if the condition was the result of want of vigour in the plants one might have expected to see it this season.

1920.—We propose this season to use sulphate of iron again, and would ask farmers to pull up an entire plant with a little earth left on the roots, double it up and send it in a small parcel to the Department for examination if specimens are found. A loss of 5 per cent. of wheat to the State is not inconsiderable, and the trouble, which may be one for the Entomologist, should be cleared up, so that dummy heads may give place to full production.

# Rice Culture in New South Wales.

**[The Experiments Supervision Committee, under whose supervision these experiments are being conducted, in making these results public draws attention to the fact that final conclusions cannot yet be drawn from these trials.]**

TRIALS with rice were first conducted in this State in 1892, but the results were not encouraging, and, after several years of experimentation, they were discontinued. The subject was revived in 1911 at Grafton Experiment Farm, when several varieties, imported from the Central Provinces of India, were grown under the natural rainfall conditions. They were tried again the following year, but on neither occasion with any great success.

In 1915 a good deal of publicity was given to the results obtained with rice under irrigation at Swan Hill, Victoria, by a Japanese resident, Mr. Takasuka. On inquiry it was learned that this gentlemen had been experimenting with the crop since 1906, and, after trying a great number of varieties from Japan, he had at length obtained, by selection and improvement, a strain which he called "Takasuka," and from which he had harvested 1 ton of grain per acre.

This variety was grown under irrigation at Yanco Experiment Farm in 1916 and 1917, but hot winds about the time of flowering resulted in a very poor crop.

The 1917–18 crop was practically destroyed by locusts, though sufficient seed was obtained to sow the following year, when, owing to very bad germination, the crop was a comparative failure.

In 1919, Takasuka, together with three varieties from California, was sown, and in this year arrangements were made for a continuous supply of water during the growing of the crop. At Yanco this results in a very heavy growth of weeds (barnyard grass and stickweed), and early in January the rice appeared in danger of being choked out.

The prices obtained in California, on almost identical soil to that at Yanco, and the present price of rice (£45 per ton, with the prospect of it reaching £60 in the near future) render it advisable that trials of the crop be persevered with.

Weeds are a problem with any summer crop at Yanco Experiment Farm. Rice is not a rank grower, and, under the continuous irrigation method, no cultivation can be carried on, so that the weeds have every opportunity.

The remedy seems to be, either the selection of a piece of virgin soil for future trials, or the fallowing and cleaning of a piece of land in preparation for the following season's experiment.

# Wheat Plots at Narromine, 1919.

J. E. SYME, Inspector of Agriculture.

UNDER the scheme formulated by the Narromine Graziers and Farmers' Association, two areas of 20 acres were sown under the supervision of the Department of Agriculture—one on the property of Mr. R. Griffiths, "Kabinga," Narromine, and the other on the property of Mr. Barry O'Neil, Narromine. The land had already been fallowed when the Department undertook supervision.

The varieties chosen for the experiment were Canberra and Hard Federation. It was intended to sow manure with both plots—28 lb. of superphosphate on Mr. O'Neil's property, which is a heavy grey loam, and 40 lb. at Kabinga, which is a sandy loam—but owing to a misunderstanding no manure was available for the first-mentioned plot and it was sown without.

The land at Kabinga was ploughed early in August, 1918, with a mouldboard plough, worked with a spring-tooth early in October, lightly harrowed during the second week in February, 1919, cultivated in the third week in March and again before sowing, which took place on 15th and 16th May, at the rate of 50 lb. seed with 40 lb. of superphosphate per acre. Good rains fell after planting and the wheats grew on without a check, there being plenty of moisture in the subsoil before planting.

A couple of strips through the crops were left without manure, and the result was remarkable, the growth of those strips being stunted and thin, while on the manured portion the growth was good and uniform. The Canberra, all except a small plot left for grain, was cut for hay on 7th October, 1919.

### The Yields.

The yield of hay was 23½ cwt. to the acre, while the stripped portion yielded 14 bushels of good grain to the acre with a bushel-weight of 62¼ lb. The Hard Federation was harvested on 10th November, and yielded 15 bushels per acre, with a bushel-weight of 62¼ lb. These wheats did not stool much, but grew to a height of about 3 feet 6 inches, and headed well.

The land at Mr. O'Neil's property was disc-ploughed about 5 inches in August, 1918; disc-cultivated in January, 1919; scarified in February, and harrowed in May after 20 points of rain. It was scarified on 14th May after 50 points of rain, sown on 16th and 17th May, and harvested 6th and 7th November.

The fallow held very little moisture at sowing time, and the crop made very little headway at the start, although there was a good germination. It finished up remarkably well, however, the Hard Federation yielding 5 bushels 53 lb., and the Canberra 5 bushels 33 lb. of very fair grain.

### Working the Land Pays.

The rainfall for the three months previous to sowing on Mr. Griffiths' plot was:—February, 125 points; March, 58; April, 11 (total, 194 points); and on Mr. O'Neil's plot—February, 46 points; March, 45; April, 20 (total, 111 points). The rainfall on the growing crop was as follows:—

| | May. | June. | July. | August. | September. | October. | Total. |
|---|---|---|---|---|---|---|---|
| | Points. | Points. | Points. | Points. | Points. | Points. | Points. |
| R. Griffiths' ... ... | 355 | 12 | 43 | 129 | 5 | ... | 544 |
| B. O'Neil's ... ... | 349 | ... | 26 | 135 | 70 | ... | 580 |

The rainfall was fairly even for the two plots, but the heavy soil on Mr. O'Neil's property will not hold moisture in a dry period like a sandy loam, and Mr. Griffiths worked his soil much earlier than Mr. O'Neil, creating a mulch which retained much moisture that would otherwise have evaporated. A small shower of rain (even if only 20 points) can do a lot of harm by forming a soil crust which, if not broken, means much loss of moisture by evaporation. While such loss does not matter so much in a good season, neglect to repair the leakage is a serious matter in a dry one.

## Consider Your Working Horses.

While travelling on the Northern Rivers recently, I several times saw horses with bags over their noses to prevent them from biting at the corn while they were working in the cultivator. This practice seems unnecessary and a little inhumane. Even if the bag has holes cut in the bottom it is drawn up against the nostrils and prevents proper respiration. The distress thus caused must be very great when the animal is doing heavy work, especially in the sweltering heat—as everyone who had experience of the masking regulations during the influenza epidemic will speedily realise! It is admitted that some means must be employed to prevent horses from "snapping" at the crop, and the Department has for years past in its orchards used muzzles made from a piece of fencing wire, twisted into a ring to fit easily over the horse's nose and covered with wire netting. This is held in position by a strap or a piece of plough line looped over the head at the back of the ears. These muzzles cause no discomfort to the horse, and have proved quite effective in preventing them from snapping at the trees.—W. le Gay Brereton, Assistant Fruit Expert.

## The Effect of Cross-pollination.

Reporting the results of a study during three years of the effect of cross-pollination on apples, Mr. W. H. Wicks, in Arkansas Agricultural Station Bulletin 143, states that he could detect no influence of any variety used as a cross-pollinizer on the size, colour, shape and quality of the fruit of the female parent. He concluded that apple-growers are justified in planting varieties primarily for the benefit of cross-pollination to secure the normal development of the apple.

# Farmers' Experiment Plots.

## Wheat and Oats Experiments, 1919.

### Western District.

J. E. SYME, Inspector of Agriculture.

Wheat and oats experiments for 1919 were conducted by the Department in conjunction with the following farmers :—

W. W. Watson, Woodbine, Tichborne, *via* Parkes.
E. A. Draper, Harris Park, Alectown West.
E. J. Allen, Gregra.
S. Reilley, jnr., Eurimbla Roadside, *via* Molong.
M. F. Dalton, Duntry League, Orange.
D. A. Rich, Roselayne, Curra Creek, Wellington.
J. Parslow, Kelvin Grove, Collie Road, Gilgandra.
W. R. Werner, Pinefield, Nymagee.
E. P. Quinn, Tarella.
S. G. McCauley, Osterley, Ootha.
J. W. Johnston, Baldry.
A. Milgate, Rockvale, Back Trundle Road, Parkes.

At Narromine the plots were choked with cobbler's peg which, owing to the dry season, soon outgrew the wheat. At Ootha, Baldry and Parkes, although the plots looked well at the start, towards the end they burnt off and did not mature grain.

#### Cultural Notes.

*Tichborne.*—Soil, grey loam ; ploughed July, 1918 ; disc-cultivated October ; spring-toothed at the end of February, 1919, and disc-cultivated at the end of April ; drilled in 5th and 6th May, 50 lb. seed and 42 lb. of superphosphate per acre.

*Alectown West.*—Land, strong red soil ; mouldboard-ploughed and harrowed September, 1918 ; harrowed October ; disc-cultivated February, 1919 ; harrowed April, and harrowed and disc-cultivated May ; sown 4th, 5th and 6th June, 60 lb. seed and 28 lb. superphosphate per acre.

*Gregra.*—Soil, heavy red loam ; ploughed with mouldboard in August, 1918, and potatoes, grain sorghums, and maize drilled in, but no germination resulted ; ploughed 5 inches at the beginning of March, and late wheat sown 15th April, 1919, 50 lb. of seed and 28 lb. superphosphate per acre. The remainder was spring-toothed twice on the 1st and 3rd June, and early wheats sown on 5th June, 57 lb. seed and 28 lb. superphosphate per acre.

*Eurimbla.*—Soil, red to grey loam ; ploughed October, 1918 ; disced with the sundercut (a twin disc cultivator) at the beginning of April, 1919, and sown 24th and 25th April, 58 lb. seed and 50 lb. superphosphate per acre.

*Orange.*—Soil, red loam; ploughed with mouldboard, harrowed, rolled and harrowed March, 1919, on account of the big clods; rolled and harrowed in May; sown 19th May, 60 lb. of seed and 56 lb. superphosphate per acre. Rolled and harrowed in August, 1919.

*Wellington.*—Land, red heavy soil to grey loam; disc-ploughed first week in September, 1918; spring-toothed 1st June, 1919; ploughed 14th June; harrowed 16th June and sown 16th and 17th June, 58 lb. of seed and 60 lb. of superphosphate per acre.

*Gilgandra.*—Land, grey loam to heavy black soil; ploughed first week in September, 1918; harrowed December, and again 14th April, 1919; sown on 23rd and 25th April, 48 lb. seed and 28 lb. superphosphate per acre.

*Nymagee.*—Soil, medium red loam; ploughed first week August, 1918; harrowed September; one way disced 19th and 20th February, 1919; harrowed 23rd February, and one way disced 9th and 10th April; sown 6th and 7th May, 45 lb. seed and 28 lb. superphosphate per acre.

### Rainfall.

The rainfall in the various districts was as follows:—

AMOUNT of Rainfall on the Fallow.

| | Tichborne. | Alectown West. | Gregra. | | Eurimbla. | Wellington. | Gilgandra. |
|---|---|---|---|---|---|---|---|
| | | | Late Wheats. | Early Wheats. | | | |
| 1918. | Points. | Points. | Points. | Points. | Points. | Points. | Points. |
| August ... ... | 270 | ...... | 352 | 352 | ...... | ...... | ...... |
| September ... | 40 | 40 | 37 | 37 | ...... | 32 | 15 |
| October ... ... | 76 | ...... | 60 | 60 | 157 | 24 | 43 |
| November ... | 34 | 30 | 41 | 41 | 47 | 40 | 24 |
| December ... | 81 | ...... | ...... | ...... | 64 | 6 | 20 |
| 1919. | | | | | | | |
| January ... ... | 59 | 72 | 29 | 29 | 60 | ...... | 34 |
| February ... | 345 | 112 | 173 | 173 | 124 | 120 | 96 |
| March ... ... | 25 | 8 | 26 | 26 | ...... | 31 | 45 |
| April ... .. | 46 | 31 | ...... | 46 | ...... | 46 | 39 |
| May ... ... | ...... | 313 | ...... | 276 | ...... | 429 | ...... |
| Total ... | 976 | 606 | 718 | 1,040 | 452 | 728 | 316 |

AMOUNT of Rainfall on Growing Crops.

| | Tichborne. | Alectown West. | Gregra. | | Eurimbla. | Wellington. | Gilgandra. | Nymagee. | Orange. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Late Wheats. | Early Wheats. | | | | | |
| 1919. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. |
| April ... ... | ... | ... | 46 | ...... | ... | ... | ... | .. | ... |
| May ... ... ... | 267 | ... | 276 | ..... | 310 | ... | 444 | 207 | 325 |
| June ... ... ... | 80 | 57 | 52 | 52 | 63 | ... | 26 | ... | 106 |
| July ... .. ... | 26 | ... | 47 | 47 | 40 | 34 | 55 | 2 | 123 |
| August ... ... | 149 | 140 | 127 | 127 | 159 | 134 | 79 | 82 | 208 |
| September ... ... | 132 | 90 | 37 | 37 | 123 | 50 | 33 | ... | 227 |
| October ... ... | 25 | ... | 37 | 37 | 35 | ... | 10 | 32 | 58 |
| November ... ... | ... | 11 | 136 | 136 | 74 | 30 | ... | ... | ... |
| Total ... ... | 679 | 298 | 758 | 436 | 804 | 248 | 647 | 323 | 1,047 |

**The Season.**

The season was a very bad one for wheat-growing, starting from the time fallowing was commenced, as the rainfall in the beginning of 1918 was so light that at fallowing time the moisture had practically dried out to a great depth. From September, 1918, to February, 1919, there was very little rain, distributed in such small falls that it soon evaporated. In February, 1919, some heavy falls (mostly thunderstorms) put moisture into the soil, but not to any great depth, and as the subsoil was so dry this moisture did not last. From February on to planting time the soil, with a very few exceptions, was almost bone-dry, and the seed had either to be planted in a dry seed-bed or held over for later planting when rain came in May. In that month every district had fair storm rains, which germinated the seed, but these were not followed by others, and consequently had little other effect. As a result, the crops lacked sufficient moisture to keep them going when maturing, and the bigger part of them burned off. As an example, the plots at Gilgandra may be quoted: 444 points out of the total 647 points on the growing crop fell here immediately the crop was sown, there being only 203 points for the following five months. To make matters worse, there was no reservoir of moisture in the underlying soil to supplement that at the surface.

The light rainfall had another ill effect; it did not consolidate the seed-bed—one of the main requirements for successful wheat-growing. The heavy sorts were the first to burn off, the lighter sandy loams holding the moisture much better.

RESULTS of Wheat Variety Trials.

| Variety. | Tichborne. | Alectown West. | Gregra. | Eurimbla. | Wellington. | Gilgandra. | Nymagee. |
|---|---|---|---|---|---|---|---|
| | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. |
| Canberra ... ... | 13 17 | 5 0 | 10 28 | 18 14 | 4 15 | 10 30 | 11 6 |
| Major ... ... .. | 7 55 | * | † | † | ...... | ...... | ... |
| Penny ... ... ... | 9 32 | ...... | 5 45 | † | 5 0 | ...... | ...... |
| Cowra No. 15 ... ... | 11 29 | 3 20 | ...... | † | ...... | 6 40 | 13 12 |
| Warden ... ... | 6 53 | 2 46 | ...... | ...... | ...... | 1 57 | * |
| Currawa... ... ... | 10 8 | ...... | ...... | ...... | ...... | ...... | ...... |
| Federation ... ... | 11 40 | 3 42 | † | 14 45 | 8 15 | 7 59 | 4 46 |
| Hard Federation ... | 10 32 | 6 6 | 10 53 | 19 48 | 8 0 | 10 20 | * |
| Improved Steinwedel... | 9 34 | 3 35 | ...... | ...... | ...... | 7 29 | 10 36 |
| Clarendon ... ... | 12 24 | ...... | 9 29 | 16 9 | ...... | ...... | * |
| Turvey (local) ... ... | 8 42 | ...... | ...... | ...... | ...... | ...... | ...... |
| Roseworthy ... ... | ...... | * | ...... | ...... | ...... | ...... | ...... |
| Yandilla King... ... | ...... | * | 5 14 | † | ...... | 3 6 | ...... |
| Bomen ... ... ... | ...... | 1 6 | 7 31 | ...... | ...... | 2 0 | ...... |
| Florence... ... ... | ...... | 4 26 | ...... | ...... | ...... | ...... | 12 54 |
| Rymer ... ... ... | ...... | ...... | 8 24 | ...... | ...... | 4 22 | ...... |
| Marquis... ... ... | ...... | ...... | ...... | † | ...... | ...... | ...... |
| Billy Hughes (local) ... | ...... | ...... | ...... | ...... | 5 0 | ...... | ...... |
| Red Wings (local) ... | ...... | ...... | ...... | ...... | 6 0 | ...... | ...... |
| Marshall's No. 3 ... | ...... | ...... | ...... | ...... | 8 0 | ...... | ...... |
| Sensation (local) ... | ...... | ...... | ...... | ...... | 4 30 | ...... | ...... |
| Bunyip .. ... ... | ...... | ...... | ...... | ...... | ...... | 6 49 | 9 43 |
| Warren ... ... ... | ...... | ...... | ...... | ...... | ...... | 6 32 | ...... |
| Sunset ... ... ... | ...... | ...... | ...... | ...... | ... | ...... | * |

* Indicates Failure. † Cut for Hay.

## Notes on Varieties.

The season was distinctly favourable to the early varieties; the dry conditions gave the late varieties no chance at all, and in most cases they failed to mature grain. As in 1918, the weakness or liability to disease of the different varieties was not apparent, but in point of yield, Hard Federation and Canberra held pride of place; in the seven plots in which grain matured, Hard Federation was top yielder in three districts and Canberra in two, while Federation and Cowra No. 15 were each top in one. All the other early wheats (such as Clarendon, Improved Steinwedel and Bunyip) did well, and Federation upheld its reputation as a good yielder under all circumstances. Currawa also did well in the only plot in which it was tried, as did also Cowra No. 15, which came out top at Nymagee and did well in other centres.

In seven trials in which Federation was compared with Hard Federation, the former averaged 7 bushels 32 lb., and the latter 9 bushels 25 lb. Canberra averaged 10 bushels 24 lb. in seven centres.

MANURIAL Experiments.

| Locality. | Variety. | No Manure. | Superphosphate per acre. | | | | |
|---|---|---|---|---|---|---|---|
| | | | 28 lb. | 42 lb. | 56 lb. | 60 lb. | 112 lb. |
| | | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. |
| Tichborne ... | Canberra ... | 11 55 | 12 15 | 13 17 | 14 0 | ... | ... |
| Wellington ... | Marshall's No. 3 | 2 30 | ... | ... | ... | 8 0 | 6 0 |
| Alectown West | Hard Federation | 5 0 | 66 6 | ... | ... | ... | ... |
| Gregra ... .. | ,, | 12 58 | 10 53 | 11 24 | 10 34 | .. | ... |

RATE of Seeding Experiments.

| Locality. | Seed per acre. | | | | | |
|---|---|---|---|---|---|---|
| | 42 lb. | 58 lb. | 71 lb. | 57 lb. | 45 lb. | 33 lb. |
| | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. | bus. lb. |
| Wellington ... | 4 45 | 8 0 | 7 0 | ... | ... | ... |
| Eurimbla ... ... | 18 30 | 14 45 | 19 23 | ... | ... | ... |
| Nymagee ... ... | ... | ... | ... | 14 4 | 11 6 | 7 32 |

The manurial experiments showed a slight increase with manure on the lighter soils, but on the strong red soil at Gregra its application resulted in a slight decrease.

The seeding trials show an increase with the heavier seeding; in fact, the past two years tend to show that there is some doubt whether light seeding is more profitable than heavier seeding in dry districts. After all, the main supply of moisture is to be expected from below, not laterally. In the

more humid districts the lighter seedings may give the more profitable results, because the plants have a better chance to stool out, but in districts where they depend more on stored moisture below and where the plants do not stool the heavier seeding seems to give the best results.

### Introduced *versus* Acclimatised Seed.

This experiment took place at Eurimbla, where the introduced seed (Hard Federation) yielded 19 bushels 48 lb., and the acclimatised seed 16 bushels 44 lb.

### Worked *versus* Unworked Fallow.

This trial took place at Gilgandra with Canberra. The unworked fallow yielded 10 bushels 3 lb., and the worked fallow yielded 10 bushels 30 lb., the worked fallow getting two harrowings, while the unworked had one just before planting.

A trial, fallow *versus* non-fallow, also took place at Alectown West, the variety used being Hard Federation. Here the fallow produced 6 bushels 6 lb., while the unfallowed was a failure.

### Manured *versus* Unmanured Fallow.

This experiment took place at Alectown West. Hard Federation wheat was used, and superphosphate was applied at the rate of 28 lb. per acre. The manured fallow yielded 6 bushels 6 lb., and the unmanured fallow 5 bushels, a difference of 1 bushel 6 lb. in favour of the manure, which cost approximately 1s. 3d.

### Harrowing Test.

A crop harrowing test was held at Gilgandra with Hard Federation wheat. The unharrowed plots gave a return of 10 bushels 20 lb., and the harrowed plots 9 bushels 32 lb.

### Oat Variety Trials.

Oat variety trials were successful at six centres, the results being as follow :—

RESULTS of Oat Variety Trials.

| Locality. | Ruakura. | | Algerian. | | Sunrise. | | Guyra. | | Lachlan. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | bus. | lb. | bus. | lb. | bus. | lb. | bus. | lb. | bus. | lb. |
| Tichborne ... | ...... | | 15 | 6 | ...... | | ...... | | 20 | 0 |
| Gilgandra ... | 2 | 38 | ...... | | 11 | 20 | ...... | | 11 | 5 |
| Wellington ... | ...... | | 3 | 6 | ...... | | ...... | | 2 | 5 |
| Nymagee ... | ...... | | ...... | | 26 | 29 | ...... | | 10 | 13 |
| Eurimbla ... | 46 | 5 | 48 | 6 | 40 | 25 | ...... | | 51 | 37 |
| Gregra ... | ...... | | ...... | | 13 | 22 | 20 | 5 | 15 | 3 |

The yield at Eurimbla was again very satisfactory, considering the rainfall was only 804 points on the growing crop, while at Nymagee, with a rainfall of 323 points on the growing crop, Sunrise oats produced 26 bushels 29 lb.

### Wheat and Oats Variety Trials for Hay.

These trials were conducted on the property of Mr. M. F. Dalton, at Orange, without fallow, 1 bushel of wheat and 1 bushel of oats being sown with 56 lb. of superphosphate per acre.

RESULTS of Hay Trials.

| Varieties. | Yield per acre. | | | |
|---|---|---|---|---|
| | t. | c. | q. | lb. |
| Oats— | | | | |
| Ruakura ... ... ... ... | 1 | 7 | 0 | 0 |
| Lachlan ... ... ... ... | 1 | 9 | 2 | 23 |
| Guyra ... ... ... ... | 1 | 12 | 1 | 18 |
| Sunrise ... ... ... ... | 1 | 12 | 1 | 18 |
| Wheat— | | | | |
| Warden ... ... ... ... | 1 | 11 | 0 | 14 |
| Marquis ... ... ... ... | 1 | 7 | 2 | 27 |
| Rymer ... ... ... ... | 1 | 7 | 3 | 24 |
| Cleveland ... ... ... ... | 1 | 13 | 1 | 25 |
| Marshall's No. 3 ... ... ... | 1 | 5 | 2 | 19 |
| Thew... ... ... ... ... | 1 | 11 | 0 | 14 |

### Manurial Tests for Hay.

Manurial experiments were conducted with Warden. The growth of the different plots was proportionate to the amount of manure used, the unmanured plot being very backward in growth.

RESULTS of Wheaten Hay Manurial Trials.

| Manure. | Yields. | | | |
|---|---|---|---|---|
| | t. | c. | q. | lb. |
| 56 lb. Superphosphate ... .. | 1 | 11 | 0 | 14 |
| 42 ,, ... ... ... | 1 | 4 | 1 | 14 |
| 28 ,, ... ... .. | 0 | 16 | 1 | 22 |
| No manure ... ... ... ... | 0 | 14 | 3 | 3 |

These tests show conclusively that in this district—even in the dry season experienced—the heaviest amount of manure is the best.

### Barley Tests.

Barley tests were conducted at Gilgandra and Alectown West, but at the latter place no results were obtained. At Gilgandra, Goldthorpe barley was sown at the rate of $1\frac{1}{2}$ bushels, with 28 lb. of superphosphate per acre. The barley came away well, and formed a nice even crop, but failed to form much grain, the yield being only 2 bushels 24 lb.

"THE *Gazette* has been a source of great help to me and should be in the hands of every agriculturist."—A Coolamon Reader.

# Fertilisers for Green Winter Fodders.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

WITH the approach of the season for sowing wheat and oats for green winter feed on the coast and tablelands, the experience gained by the Department in fertiliser trials on experiment farms and farmers' experiment plots will be of interest. Farmers are advised to take the results given hereunder as being more thoroughly reliable and representative than individual results obtained even on their own farms, the figures given being an average of several tests, extending over many varied seasons. Individual records are not always quite reliable owing to seasonal differences and to experimental errors not being entirely eliminated on farmers' plots.

Most of the figures obtained for coastal plots are from alluvial soils, for which many farmers are still of the opinion that no fertilisers are needed. In all cases where recommendations are made, care has been taken to consider the cost of the fertiliser and to determine the profitableness or otherwise of the application, based on the value of the increased fodder produced. For this purpose the green winter fodder has been valued at 15s. per ton, which is considered an average figure for this produce on the farm, though possibly lower than recent values when comparisons are made with other foodstuffs.

### Coastal Districts.

In an average of nine tests, 1 cwt. superphosphate per acre has given an increase of 5 cwt. green fodder over the application of 2 cwt. superphosphate per acre, so that the larger amount appears to be unnecessary. Likewise, 1 cwt. superphosphate produced an increase of 4 cwt. per acre of green fodder above that obtained from 2 cwt. P7 mixture (equal parts of superphosphate and bonedust) which has done so well for maize on the coast. The addition of 28 lb. of sulphate of potash to 1 cwt. superphosphate has produced an average increase of 6 cwt. of green fodder per acre, but the value of this increase is more than counterbalanced by the cost of potash fertiliser at present, so that it cannot be recommended for this crop. The application of 2 cwt. Thomas' phosphate has given a greater increase than 1 cwt. superphosphate, and also a higher net profit per acre (taking pre-war cost of fertiliser), but unfortunately this fertiliser is not quoted on the market just now.

The addition of ½ cwt. sulphate of ammonia to 1 cwt. superphosphate has meant an increase of 1 ton 6 cwt. per acre of green fodder, valued at 19s. 6d. With a cost of 13s. for the extra nitrogenous fertiliser, a profit of 6s. 6d. per acre has been made from its use. Owing to the small number of tests made so far with sulphate of ammonia (for which nitrate of soda could also be substituted), the Department is disinclined to recommend the use of these

fertilisers in all cases. On land that is less fertile than the average, or that is lacking in organic matter, these nitrogenous fertilisers could, perhaps, be used with profit. On such lands, however, good crops of maize cannot be expected to immediately follow, as the cereal crops have a rather exhausting effect on the soil. A crop of cowpeas for green manuring or for grazing with pigs would add nitrogen more cheaply and more profitably, and would ensure a better maize or sorghum crop the following season. The writer has in mind many of the upland soils of the South Coast, which are used for growing winter and summer fodder crops alternately and which are not as fertile as the alluvial soils. A good rotation, which would maintain or improve the soil fertility and enable heavier fodder crops to be grown, would be as follows :—

| | |
|---|---|
| Wheat, or wheat and peas ... ... | Sown in April. |
| Cowpeas ... ... ... ... | Sown in November. |
| Maize, sorghum or Sudan grass ... | Sown in October. |

This would give three fodder crops in two years and could be worked in two paddocks, so that summer and winter fodders are grown each season.

On the whole then, 1 cwt. superphosphate per acre can be thoroughly recommended for winter green fodder crops on the coast. In an average of sixteen tests it has given an increase of 1 ton 1 cwt. per acre over the unmanured plots. Thus, with an increase of 15s. 6d. in the value of the crop as against a cost of 5s. 6d. for superphosphate, a net profit of 10s. per acre has been made from the fertiliser.

### Southern Tablelands.

Not many tests have yet been made with fertilisers for green winter fodders on the Southern Tablelands, but the few that have been conducted indicate that 2 cwt. superphosphate per acre is the best fertiliser. An average increase of 3 tons 8 cwt. fodder per acre has been made, giving a net profit of 40s. per acre.

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## Effect of Subsoiling and Deep Tillage.

Reporting the results of extensive subsoiling experiments at twelve stations in the Great Plains area of the United States over an average of five and a half years, Messrs. E. C. Chilcott and J. S. Cole, in the *Journal of Agricultural Research*, Vol. xiv, No. 11, show that subsoiling and deep tilling have been of no value in overcoming drought. The effect, on the contrary, apparently has been to reduce the yields in those seasons that are below the average in production. Experiments have been conducted with the subsoil plough, a deep tillage machine and dynamite, but the effect of deep tillage appears to be essentially the same, irrespective of the means by which it is accomplished. "The quite normal popular belief in the efficiency of deep tillage as a means of overcoming drought or of increasing yields has little foundation of fact, but is based on misconceptions and lack of knowledge of the form and extent of the root systems of plants, and of the behaviour and movement of water in the soil."

# Note on the Classification of Wheat Varieties.

F. B. GUTHRIE AND G. W. NORRIS.

THE commercial value of any sample of wheat, though not, perhaps, so important to the farmer as its acre-yield or drought and disease-resisting qualities, is nevertheless of considerable importance, and if it were possible to assign a money-value to the different varieties this factor, taken in conjunction with the yield, would be a most valuable one to the wheat-grower. It is not possible, however, to do this with any accuracy. The nearest approach to such a valuation is an attempt to classify the different varieties with reference to their behaviour in the mill, as the milling-quality of a sample, the proportion and quality of flour and offals obtainable from it, determines its monetary value to the miller.

Such a classification is also of importance to exhibitors of wheat samples at the agricultural shows, as most show schedules include prizes for different classes of wheat. It was with the object of assisting competitors in this direction that the Department has for years published in its schedule of exhibits at the Royal Agricultural Society's Show a rough classification of wheat varieties, revising it from year to year.

As the question is one of interest to wheat-growers generally, as well as to wheat-breeders, buyers and sellers, a table giving such a classification is published herewith. The table was compiled by Mr. G. W. Norris, who has acted for many years past as one of the judges in the wheat section at the show, and who has been responsible for the milling of the samples competing for prizes.

The figures represent the average results obtained over a series of years, and include not only the show-wheats mentioned above, but samples obtained from wheat-growers and from farms and experimental plots under the direction of the Department.

All samples included are true to name.

It must, however, be borne in mind that such a classification is not an exact one, and is liable to modification from time to time—even from season to season. This is particularly the case with those wheats classed as "weak flour" and some of those in the "medium strong" class.

This is due partly to the influence of the season and partly to the fact that some of the varieties are undoubtedly changing their characteristics under continued cultivation. With the above reservation, the table affords a fairly reliable guide as to the results to be expected on milling the varieties mentioned.

MILLING VALUE of some of the Principal Wheats.

| Variety. | Weight per bushel. | Percentage of Flour. | Strength of Flour. | Percentage of Dry Gluten. | Colour of Flour. |
|---|---|---|---|---|---|
| **N.S.W. Strong White Wheats—** | | | | | |
| Comeback ... ... ... | 66·1 | 72·7 | 53·0 | 13·3 | Excellent. |
| Bobs ... ... ... ... | 65·7 | 72·0 | 50·5 | 12·3 | Very good. |
| **Strong Red Wheats—** | | | | | |
| Cedar ... ... ... | 67·4 | 71·0 | 53·3 | 12·9 | Excellent. |
| Marquis ... ... ... | 66·4 | 70·4 | 49·3 | 12·3 | ,, |
| **Medium Strong Wheats—** | | | | | |
| Haynes' Blue Stem ... | 61·5 | 69·8 | 48·2 | 13·8 | ,, |
| Florence ... ... .. | 66·0 | 72·6 | 48·1 | 13·8 | ,, |
| Hard Federation ... ... | 63·9 | 71·6 | 48·6 | 11·8 | ,, |
| Rymer ... ... ... | 63·0 | 70·0 | 47·5 | 12·2 | ,, |
| Bunyip ... ... ... | 64·1 | 71·8 | 45·9 | 11·9 | ,, |
| Marshall's No. 3 ... ... | 61·1 | 71·0 | 46·8 | 11·6 | Good. |
| Cleveland ... ... ... | 64·1 | 72·1 | 47·1 | 10·5 | ,, |
| Sunset ... ... ... | 63·0 | 69·0 | 48·3 | 14·1 | ,, |
| Thew ... ... ... | 62·0 | 70·0 | 46·5 | 11·0 | ,, |
| Zealand ... ... ... | 61·0 | 70·0 | 46·6 | 11·8 | ,, |
| Yandilla King ... ... | 65·0 | 72·3 | 45·5 | 10·2 | ,, |
| Improved Steinwedel ... | 61·5 | 70·0 | 45·6 | 10·6 | ,, |
| Firbank ... ... ... | 63·0 | 72·2 | 45·6 | 12·7 | ,, |
| Canberra ... ... ... | 64·0 | 71·0 | 45·2 | 11·2 | ,, |
| **Weak Flour Wheats—** | | | | | |
| Bomen .. ... ... | 63·1 | 72·0 | 44·8 | 12·3 | Excellent. |
| Warren ... ... ... | 66·3 | 71·4 | 45·0 | 11·6 | Good. |
| Federation ... ... ... | 65·4 | 71·1 | 44·7 | 9·8 | ,, |
| **Macaroni Wheats—** | | | | | |
| Huguenot ... ... ... | 60·9 | 66·8 | 53·5 | 20·3 | Low. |

## FURTHER REPORTS ON ELEPHANT GRASS.

THE continued success of Elephant grass as a fodder yielder is indicated by the appended reports received by the Agrostologist.

Mr. R. N. Makin, Inspector of Agriculture, writes: "The Elephant grass roots were planted in rows 4 feet 9 inches apart each way on 27th October, 1919, on Mr. J. H. Martin's farm at Pambula. The growth has been dense and strong. The rainfall from 1st October to 31st January totalled 18·39 inches, of which 728 points fell in January. The crop has now been cut, the yield being 49 tons 18 cwt. 1 qr. of greenstuff per acre. The ground on which the plot was situated benefited last year from the silt left by the flood-waters. The return is very satisfactory; this new fodder plant and Sudan grass are attracting a good deal of attention in the district."

Mr. E. A. Lamotte, Moor Creek, Tamworth: "I planted the six roots you sent me, and five grew. Four I put in sandy loam, and one in red soil at the end of the wash-house drain. The four plants grew to a height of 3 feet, then the stock ate them down twice, and they are now 2 feet in height. The one root in the red soil was also eaten down twice, and is now 5 feet high. No water was given to the four roots once they were established, and only 7 inches of rain fell during the growing period of six months. I intend to continue transplanting from these roots until I have sufficient plants for an acre, as I am satisfied that this grass will grow well in sandy loam under dry conditions, and in red basaltic soil under irrigation."

# A Remarkable Fodder Plant.

## Shearman's Clover (*Trifolium fragiferum* var.).

E. BREAKWELL, B.A., B.Sc., Agrostologist.

A clover that will hold its own with paspalum, that will carry four to five head of stock per acre during its growing season, that is eaten so greedily as to cause bloating in half an hour, that will outstrip any clover yet known in vigour of growth on wet soils, that appears to be equally palatable at any stage of its growth—such is a description which may fairly be applied to a new fodder plant recently brought to light.

This clover is now well established on the low-lying situations at Fullerton Cove, near Newcastle. It was originally observed and was first fostered by Mr. J. H. Shearman, a dairyman in that locality. The story of that development may well be told in Mr. Shearman's own words :—

The first time I noticed it, as far as I can recollect, was about twenty-two years ago (1897). It was then a small plant, running for a distance of about 6 inches on the edge of a small drain or gutter that required cleansing at intervals. This drain ran through the lucerne that was growing there at the time, and, the land not being worked, the young plant, which would otherwise have been destroyed, was allowed to spread. When I noticed how the plant grew so vigorously, my curiosity became aroused, and I often inspected the plant. It soon grew along the drain for a distance of 20 feet, and blocked the water from running. The clover had then to be shovelled out, and I put it in a grazing paddock, where I fully expected that the cattle, by continuously eating it down, would kill it. To my surprise, however, it grew and spread, killing out most of the other grasses as it ran over the ground. This process took about ten years before I discovered that I had a clover really worth caring for. I then began to plant it as fast as possible, and at present have about 12 acres fully covered and growing beautifully.

I am now able to make a fine lot of hay each year of exceptionally good quality. The clover grows so vigorously when the land is dry that, without any exaggeration whatever, it is capable of grazing four to five head of cattle per acre during the summer months. Of course, I am only referring to land similar to my own, which was originally a salt marsh and has been considerably enhanced in value by the clover, which appears to grow almost as well in water as out. So far I have found no seed.

### A Comparison with Strawberry Clover.

At first sight, and before it has flowered, this clover would pass for Strawberry clover. The two plants have, however, been side by side for some time on the property of Mr. Alan Smith, Fullerton Cove, and also during the past twelve months at the Botanic Gardens. An examination of the two plants during their growing period reveals some striking comparisons and certain points of difference. Under similar conditions Shearman's clover spreads three times as quickly as Strawberry clover and produces fully six times the quantity of feed. The leaves of Shearman's clover are long, distinctly elliptical, and in the young stages are marked by brown dots irregularly distributed over the surface; the leaves of Strawberry clover are smaller, rounder, and in their young stages are marked by dots regularly distributed, generally forming a shape something like a horseshoe. Although the flowers in these plants are very similar, those of Shearman's clover have

**Shearman's Clover** (*Trifolium fragiferum* var.)

Note the vigorous creeping root system, and also that the leaves are much larger (especially longer) than in Strawberry Clover.

not been known to mature seed. As is well known, the flower head of Strawberry clover, when about to mature seed, changes considerably in appearance, the seeds becoming enclosed in inflated husks, giving the flower head the strawberry-like appearance which first suggested its name. In Shearman's clover, however, a close investigation shows that the flowers do not change their appearance, but gradually wilt, shrivel and die. In one or two cases only has there been a tendency in a few of the bottom flowers of the seed-head to set seed, but such " seed " has remained empty and proved valueless. It is just possible that by close attention a few seeds may be discovered, and if a seeding strain can be thus developed the value of this fodder plant would be considerably enhanced.

**Shearman's Clover (on the left) and Strawberry Clover (on the right), as grown at the Botanic Gardens, Sydney.**

Note the similarity in habit; Shearman's Clover, however, is much more vigorous.

Shearman's clover, therefore, may be said to be closely allied to Strawberry clover, but it is certainly sufficiently individual to be classified as a distinct variety. Its habits of growth, such as barrenness in seed-setting and aggressiveness in growth, and its original discovery and development from a single plant, suggest that it has resulted from a cross between two clovers—perhaps Strawberry and White, or Strawberry and Red, or even White and Red. A close study of the available literature of the world's clovers, together with an examination of the numerous different clover plants in the herbarium of the Botanic Gardens, has revealed no similar clover, and, for the present, it has been decided to name it Shearman's clover (*Trifolium fragiferum*, var.) after its discoverer, to whom much credit is due for developing the plant as he has done.


**Strawberry Clover Plant, together with the flowers and leaves of Strawberry and Shearman's compared.**

The left-hand leaf and upper flower are Shearman's, and the other parts are those of Strawberry.

### Soils Suitable for Shearman's Clover.

Many of the Fullerton Cove soils on which this clover thrives are marshy and slightly saline. There is a good area of such soil along the coast of New South Wales, and for these the clover is highly recommended, particularly as under such conditions it is generally very difficult to get any other fodder plant to grow. At Fullerton Cove it does not entirely monopolise the situation, as water couch grass (*Paspalum distichum*) grows well with it, providing a well-balanced ration. Further trials will probably show that the clover will grow on other than marshy saline soils. On the light sandy soils of the Botanic Gardens it has also done very well, but it is noticeable that a good supply of moisture is essential to keep it growing vigorously. Many of the river flats on the coast should have sufficient moisture for its development.

The clover is partial to heat if grown under moist conditions ; on the other hand, it is not killed by frosts, though in winter it is dormant.

Mr. J. H. Shearman's 12-acre Paddock of Clover at Fullerton Cove.

### Palatability and Nutritive Quality.

The palatability and nutritive quality of this clover are of the highest order ; Mr. Shearman feeds practically all his stock on it alone, and their condition is all that can be desired. As already indicated, the greediness with which dairy stock eat the clover is likely to cause bloating, and precautions have to be exercised in pasturing them, so that they do not remain on it for any length of time. Eloquent testimony to the palatability of the clover is afforded by the disinclination of stock to eat anything else on being taken from the paddock ; instead, they eagerly await the hour of repasturing. In its best growing period (the summer) hardly any impression appears to be

made on the clover under heavy stocking, so vigorously does it recover. Any surplus growth can be utilised for hay, and the quality of this is really excellent; it appears to retain its leaf better than that of most clovers.

The milk-producing quality of the clover appears to be much higher than that of an ordinary grass pasture. The following analysis by Mr. F. B. Guthrie, Chemist, will give an idea of the nutritive qualities of the clover:—

CHEMICAL ANALYSES of Shearman's Clover and Strawberry Clover compared.

| | Strawberry Clover, grown at Botanic Gardens. | Shearman's Clover, grown at Botanic Gardens. | Shearman's Clover (immature), grown at Fullerton Cove. | Shearman's Clover (mature), grown at Fullerton Cove. |
|---|---|---|---|---|
| Moisture ... ... ... | 78·73 | 80·48 | 74·45 | 74·87 |
| Albuminoids ... ... | 4·19 | 3·84 | 6·48 | 5·50 |
| Ether Extract ... ... | 0·50 | 0·47 | 0·84 | 1·60 |
| Ash ... ... ... | 3·66 | 3·43 | 4·44 | 3·38 |
| Fibre ... ... ... | 4·21 | 3·84 | 4·73 | 4·79 |
| Carbohydrates ... ... | 8·71 | 7·94 | 9·06 | 9·86 |
| | 100·00 | 100·00 | 100·00 | 100·00 |
| Albuminoid ratio ... | 1 to 2·3 | 1 to 2·3 | 1 to 1·7 | 1 to 2·4 |
| Nutritive value ... .. | 14 | 12·8 | 17·4 | 18·9 |
| *VALUES calculated to dry matter.* | | | | |
| Albuminoids .. ... | 19·69 | 19·69 | 25·37 | 21·87 |
| Ether Extract ... ... | 2·35 | 2·42 | 3·29 | 6·36 |
| Ash ... ... ... | 17·23 | 17·56 | 17·37 | 13·47 |
| Fibre ... ... ... | 19·80 | 19·16 | 18·51 | 19·06 |
| Carbohydrates ... ... | 40·93 | 40·67 | 35·46 | 39·24 |
| | 100·00 | 100·00 | 100·00 | 100·00 |

It will be noticed that there is very little difference in the nutritive values of the two clovers as grown at the Botanic Gardens; both are very satisfactory. The feeding value of Shearman's clover in its green state, as grown at Fullerton Cove, varies very little in the mature and immature stages. In its dry (hay) state, however, there appears to be a distinct advantage in cutting at the mature stage, that is, when the clover is in flower.

### Method of Planting.

As this clover has not up to the present produced seed, root planting has to be resorted to. The growth is so vigorous, however, that no difficulty whatever is encountered in establishing it. From a dozen small roots planted at the Botanic Gardens ten months ago there has spread a plot 30 square yards in extent, forming a dense mat. Spring appears to be the best time for planting. Only a limited number of roots are yet obtainable from the Department, but Mr. Shearman has kindly offered to supply small quantities to applicants who will call for them.

# Farmers' Experiment Plots.

## Potato Experiments, 1918–19.

### North Coast District.

G. C. SPARKS, Acting Inspector of Agriculture.

The farmers' potato experiments on the North Coast for the past season were located as follows :—

F. T. Johnston, Condong, Tweed River.
G. A. Forrest, Coraki, Richmond River.
C. Oliver, "Laureldale," Yorklea.
Albert Eggins, "Bromley," Grafton.
John Wilson, Coramba.
Frank Allard, "Glenrose," Brooklana.
Henry Short, "Warrawee," Dorrigo.

The season under review was an extremely unfavourable one for potato culture. Following a severe winter, very dry conditions prevailed throughout the spring, these being particularly marked in districts north of the Orara ; of the experiments located within this area Coraki was the only one to come to harvest, and even that harvest was a meagre one. At Coramba, however, although the precipitation was much below normal, the careful preparation of the soil and the skilful after-cultivation practised carried the crop safely through, yields approaching 7 tons per acre being secured. The Dorrigo experiment, although subjected to dry conditions, received sufficient moisture for satisfactory development. There was a total absence of fungoid disease ; the resultant yields were the heaviest of the series and the greatest that have yet been secured over the three seasons of experimental work on the plateau. At Brooklana, which has invariably proved itself a safe district, results were practically uniform with other years.

#### Soil and Cultural Details.

*Brooklana.*—Basalt soil, fairly heavy, yellow, typical of eastern Dorrigo. Planted 26th November, 1918. Effective rainfall 11·88 inches.

*Dorrigo.*—Basalt, red, deep, friable. Planted 10th September, 1918. Effective rainfall 10·68 inches.

*Coramba.*—Alluvial soil, medium heavy, dark. Planted 27th August, 1918. Effective rainfall 4·20 inches.

*Coraki.*—Typical Richmond River swamp land. Drained and under cultivation seven years. Planted 14th August, 1918. Rainfall not available.

In each case the land had been under maize during the previous summer, and the preparation of the soil for these trials was practically identical, the

deep initial ploughing being given as early as circumstances permitted after the harvesting of the maize crop. As every attention was paid to the further preparations, the seed-beds were in very good order at planting. At Coraki and Dorrigo the sets were ploughed in; and at Brooklana and Coramba, drills were opened and the sets covered by hand-hoe and harrow respectively. In each case the drills were 3 feet apart and the sets 15 to 18 inches apart in the drills.

### Varieties.

While it is not suggested that any variety under trial this season should replace Manhattan as the standard for the North Coast, there are several which a perusal of the results will show to be worthy of consideration.

For the first time Up-to-Date has outyielded all others at Coramba. There seems to have been a steady improvement in uniformity in size of tuber, and on this occasion the product was beyond reproach. Its table qualities are very good. Up-to-Date is a white-skinned, oval-shaped potato, with few and shallow eyes. Its vegetative growth is tall and spreading; it is a dull green colour and bears heliotrope flowers.

Factor has been under trial on the North Coast for two seasons and promises to become a "main cropper." It is regarded as being a selection from Up-to-Date and much resembles that variety in habit of growth, the only striking difference above ground being that the flower petals of Factor have (on one season's observations) cream coloured tips. Samples of this variety were distributed for trial over the North Coast last season with most gratifying results, the consensus of opinion amongst the growers being that it was the heaviest yielder and finest quality tuber that they had ever grown.

The result of previous seasons' work indicated that the real value of Carman No. 1 on the North Coast was as a potato for home supply only, its comparatively low yielding power being more than compensated for by its high table qualities. This season, however, a marked improvement is shown, and it seems possible that it may come into more general use. The tubers of this variety are white-skinned, smooth and oblong; and the haulms tall and erect, dark green, and with deep cream coloured flowers.

Coronation has received extensive trial in this district, and although it can be relied upon to yield well at Dorrigo it has been discarded in the more truly coastal areas. It is very subject to second growth, and matures too late to be of value in the early districts of the coast. It is a blue-skinned variety, very similar in appearance to Manhattan, but of a stronger and more erect habit of growth and bearing white flowers.

Satisfaction is a well established variety on the North Coast and has been a consistent yielder throughout these experiments. It is an early red-skinned variety of very good shape, with shallow eyes. Its haulm growth is similar to, although slightly heavier than Manhattan, and bears purple flowers. It holds the record of highest yield in the variety trials at Coramba.

Langworthy is a white-skinned variety that yielded very heavily at Dorrigo in this season's experiment. The seed was introduced to the plateau in the 1917–18 experiments, but owing to the ravages of Irish blight no comparisons were possible. Its performance during the coming season will be watched with keen interest.

RESULTS of Variety Trials.

| Variety. | Brooklana. | | | | Dorrigo. | | | | Coramba. | | | | Coraki. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Up-to-Date ... ... | 7 | 0 | 1 | 22 | 11 | 0 | 2 | 4 | 6 | 19 | 0 | 22 | 2 | 1 | 1 | 0 |
| Satisfaction ... ... | 6 | 1 | 3 | 2 | 4 | 10 | 0 | 0 | 5 | 5 | 2 | 4 | 2 | 16 | 3 | 24 |
| Coronation ... ... | 4 | 2 | 2 | 0 | 12 | 15 | 2 | 4 | 6 | 5 | 2 | 24 | ......... | | | |
| Queen of the Valley ... | 3 | 14 | 2 | 16 | 10 | 19 | 1 | 8 | ......... | | | | ......... | | | |
| Surprise ... ... ... | 3 | 6 | 3 | 2 | 7 | 8 | 3 | 20 | ......... | | | | ......... | | | |
| Brownell's Beauty ... | 3 | 6 | 1 | 5 | 9 | 16 | 1 | 10 | 3 | 2 | 3 | 12 | 1 | 11 | 1 | 20 |
| Factor ... ... ... | 3 | 3 | 3 | 10 | 11 | 16 | 0 | 20 | 6 | 13 | 2 | 8 | 3 | 2 | 3 | 12 |
| Manhattan ... ... | 2 | 9 | 0 | 12 | 3 | 18 | 0 | 24 | 6 | 2 | 1 | 10 | 2 | 10 | 2 | 24 |
| Early Manistee ... ... | ......... | | | | 5 | 2 | 2 | 0 | 5 | 14 | 1 | 24 | 1 | 15 | 1 | 12 |
| Carman No. 1 ... ... | ......... | | | | 11 | 15 | 2 | 24 | 6 | 5 | 2 | 24 | 3 | 0 | 3 | 16 |
| Langworthy ... ... | ......... | | | | 12 | 14 | 0 | 12 | ......... | | | | ......... | | | |
| Premier ... ... ... | ......... | | | | 8 | 9 | 3 | 18 | ......... | | | | ......... | | | |
| New Era ... ... ... | ......... | | | | 6 | 7 | 2 | 0 | ......... | | | | ......... | | | |
| Plunkett ... ... ... | ......... | | | | 9 | 7 | 0 | 6 | ......... | | | | ......... | | | |
| Magnum Bonum... ... | ......... | | | | 11 | 1 | 3 | 4 | 4 | 6 | 1 | 24 | ......... | | | |

**Manurial Trials.**

Manurial trials were included in each experiment. The manures used, cost of application per acre (less freight), and the results achieved are shown in the appended table.

Conditions at Coraki were so unfavourable that it was scarcely to have been anticipated that any material increase would have been brought about by the manure, but it is somewhat surprising that better results were not shown at Dorrigo, where, while P8 increased the yield by 15½ cwt. per acre—which in itself shows a handsome profit—actual reductions of yield attended the applications of P5 and P7. Previous experiments have been overwhelmingly in favour of artificial manures, but it will be readily understood that without an elaborate system of check plots these discrepancies are always to be expected.

Results at Coramba are uniform with past experiments. A profit of £35 per acre is shown on the 2 cwt. superphosphate dressing; while at Brooklana, although one grows accustomed to phenomenal yields from manures on this country, this season's trials show results surpassing any previously obtained so far as actual profit following application of fertiliser is concerned. It will be seen that the P5 dressing gave an increased yield of 6½ tons per acre. After allowing £16 per ton for the potatoes (at which nett rate the crop was actually sold by Mr. Allard), and deducting the cost of the manure, a profit of £103 per acre is shown, while increases valued at approximately £80 and £60 per acre are given by the P7 and P8 plots respectively.

The fertiliser mixtures were dusted along the drills immediately prior to the dropping of the sets. The composition of the mixtures is as follows:—P7, equal parts of superphosphate and bonedust; P8, equal parts of superphosphate and blood and bone; P5, 4 parts of superphosphate and 1 part sulphate of potash.

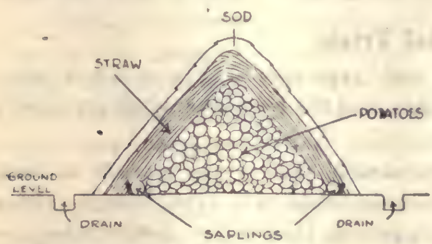
RESULTS of Manurial Trials.

| Manure. | Brooklana. | | | | Dorrigo. | | | | Coramba. | | | | Coraki. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Superphosphate, 2 cwt per acre (10s.) | 2 | 17 | 0 | 6 | 10 | 11 | 2 | 2 | 6 | 2 | 1 | 8 | 2 | 10 | 2 | 24 |
| P5, 2½ cwt. per acre (18s. 9d.) | 7 | 10 | 1 | 2 | 8 | 14 | 3 | 8 | 5 | 2 | 0 | 16 | 2 | 10 | 2 | 24 |
| P7, 3 cwt. per acre (22s. 6d.) | 6 | 1 | 3 | 2 | 10 | 5 | 0 | 20 | 5 | 6 | 0 | 8 | 2 | 8 | 3 | 0 |
| P8, 3 cwt. per acre (21s. 9d.) | 4 | 15 | 0 | 5 | 11 | 3 | 3 | 26 | 5 | 11 | 3 | 24 | 2 | 8 | 2 | 14 |
| No manure | 0 | 19 | 2 | 16 | 10 | 8 | 1 | 26 | 3 | 17 | 2 | 10 | 2 | 10 | 0 | 10 |

The varieties used in these tests were—Satisfaction at Brooklana, Queen of the Valley at Dorrigo, and Manhattan at Coramba and Coraki.

## PITTING POTATOES.

THE usual method of pitting potatoes for winter storage is to select a level piece of land, which should be so situated as to ensure drainage. Two poles or saplings are placed on the surface, parallel to one another and 4 feet apart, and the potatoes are emptied in between these so as to form a well-ridged heap. The potatoes are then covered with a thatch of straw or other suitable material, and this again is covered with sods of earth. It is important that the sodding should be done from the ground upwards (as in shingling a roof). When completed, the whole is beaten well down with the back of a spade, and a drain is cut round the pit to run off the water in case of rain.




If weather permits, it is well to let a fortnight or so elapse before earthing up—that is, to leave the potates with only their straw covering so that sweated moisture may be carried out. For a small pit (say a ton) the best shape is a cone.—A. J. PINN, Inspector of Agriculture.

## MOLASSES FOR CALF FEEDING.

REPLYING to a correspondent who had been impressed by the benefit apparently derived from a ration of skim milk and molasses by his neighbour's calves, the Herdmaster wrote: "The food value of molasses is in the nature of carbohydrates, and does not replace the fats removed from milk during separating. It is, however, successfully used in calf feeding, but must not be given in excess, especially at the start, as it tends to scour the calves. About one teaspoonful to the quart is sufficient to give in the early stages, and the amount may be increased or decreased at the feeder's discretion."

# Dairy Produce Factory Premises and Manufacturing Processes:

## The Application of Scientific Methods to their Examination.

L. T. MacINNES, Dairy Expert, and H. H. RANDELL, Assistant to the Biologist.

The manufacturer of dairy produce has always some trouble to contend with, for milk and its products lend themselves to rapid deterioration, especially through bacterial agencies. It was with a view to minimising such troubles—by presenting to those engaged in the industry such information as might be gained from scientific and practical investigations on the spot—that the scheme of examining butter factories and the manufacturing processes carried out therein was initiated and approval obtained for the services of an officer of the Biological Branch of the Department of Agriculture to be placed at the disposal of the Dairy Branch. Apart from the ordinary every-day things that are always awaiting solution, we have what might be classed as seasonal epidemics, such, for instance, as the mould infection with which a great many factory managers had to contend some two summers ago, and the effects now being felt of an extremely dry season. These influences need special inquiry as they arise. The present series of investigations, however, does not specially deal with these epidemic troubles, but is confined to those that form part of the daily routine of certain factories inspected.

In the first case to be dealt with we have effects arising out of old and faulty premises badly situated from a sanitary point of view; in other cases it had been noted that the choicest brand of butter marketed showed deterioration, more or less marked, whenever it was held in cold storage for any considerable length of time. The causes of this deterioration in quality have been traced by means of our investigations, and satisfactory remedial measures taken.

As it is intended to commence this series of articles with the results obtained from an old bacterially contaminated factory, it is considered advisable to end it by way of contrast with those from one of the most modern—a factory built on the latest sanitary lines, where fresh air and sunlight have been recognised as the greatest of germicides and freely admitted accordingly.

Some ten years ago the Alstonville Co-operative Dairy Company had trouble with the quality of the butter then being manufactured, and an officer of the Dairy Branch investigated the matter and successfully used atmospherically exposed plates to trace the origin of the infection causing

the deterioration, thereby enabling the company to remedy the matter. Knowing the value of arriving at and locating causes of deterioration by means of bacteriology, a scheme was worked out early last year whereby whatever came in contact with the dairy produce after its arrival at the factory until it was placed on the market, could be systematically examined and the results compared. The general adoption by the New South Wales dairy companies of the practice of pasteurising cream made the initiation of such investigations the more opportune. The object aimed at was twofold:

(*a*) To demonstrate the efficiency of pasteurisation as carried out at certain factories.

(*b*) To demonstrate whether or not the product was recontaminated after pasteurisation, and if so, how the infection took place.

The methods followed were very similar in all cases and were carried out as follows:—

1. Samples were taken of the cream on arrival at the factory, after blending in bulk.
2. The same lot of cream, after being neutralised and pasteurised by either the "flash" or the "holding" system as it came from the outlet pipe of the "flash" or (in the case of the holding system) direct from the tank, was again sampled. In both cases these samples were obtained before the cooling process commenced.
3. In the case of the flash pasteurisation, the plates were exposed 2½ minutes, and in one case (Example 1) five minutes to the air over the pipe cooler used first to reduce the temperature of the cream.
4. Plates were atmospherically exposed for fifteen minutes over the cream-receiving and neutralising vat in the case of Example 1 to demonstrate the extent of infection from the water spray tower; in other cases this was not done.
5. Where vats were used for holding cream (after passing over pipe coolers) pending churning, the tops of such vats being open, another series of plates were exposed to the atmosphere—for 2½ minutes in one case (Example 2) and five minutes in another (Example 1).
6. The same cream was again sampled as it came from the holding vats to enter the churns.
7. A sample was taken of the water used for cleansing and rinsing the churns and utensils.
8. A sample was taken of the water used to bring butter to the breaking point and thereafter used to wash the butter.
9. A sample was taken of the butter made from the aforementioned cream as it came from the churn.
10. Plates were generally atmospherically exposed in the churn room 2½ minutes, but in one case (Example 1) for five minutes, in all cases where the butter (or cream as it gravitated along the fluming from vat to churn) was exposed to the air.
11. A sample of the surface of the butter was taken from a box when packed and ready to be lidded.

In conjunction with making these bacteriological examinations, the produce was graded for quality at all stages, thus:—

(*a*) Cream on arrival at factory.

(*b*) Cream after treatment when ready to churn.

(*c*) Butter soon after being manufactured.

Some delay occurred in the earlier stages of the work, but eventually with the co-operation of the Biologist, Dr. G. P. Darnell-Smith, another start was made early in October, 1919, and the results of the first portions of the investigation are now available.

The Dairy and Biological Branches of the Department have approached the work in a spirit of co-operation for the benefit of the dairy industry. The Biological Branch was responsible for the bacteriological results, making the plates, isolating, identifying and counting the various colonies. The Dairy Branch, apart from initiating the scheme, supervised its operations up to the laboratory stage, correlating each step taken so that a comparison of the results might be jointly made and the information applied to the manufacture of dairy produce in a practical manner. Deductions will be made from the data brought to light, and recommendations given as to how the dairy companies can best use them to retain and further enhance the reputation already achieved for the output of their factories.

**Example 1.**

This factory was built of wood many years ago, renovated to a certain extent about 1910 or 1911, and situated on the bank of a river with a lagoon at the back; the water in the lagoon contained vegetation, was stagnant and heavily charged with germ life. This water was used to pump over the condenser of the refrigerating plant, and gave off a very apparent musty, swampy smell. The surroundings of the factory generally were unsatisfactory, and the inside premises were in a state of disrepair, floors, drains and walls needing attention. Leading from the front verandah (connected with the churn room by large double doors) were two underground earthenware 6-inch drains; these pipes were straight, no bend or sanitary trap being inserted at the factory end. They emptied into a concrete well or sump and carried off all the washings of the churns and factory generally; at the time of our visit a most offensive smell was arising from them and penetrating to all parts of the factory. When the sump was half empty the outlets of the pipes were exposed and a draught of foul air blew right through them into the churn room.

As was to be expected, butter made under such conditions was of inferior quality and showed further rapid deterioration when kept. It was arranged to make an inspection of the premises by bacteriological means, in addition to the outward examination of the premises and surroundings. Samples were taken of the cream, butter and water during the different processes of manufacture, and atmospheric exposures were made as already outlined. A room was given for use as a temporary laboratory, and in five days after our arrival the company's directors and manager were called in and shown the plates. These were explained and the company's representatives then taken through the premises and shown where the infections came from. As far as we know, this is the first time that dairy factory buildings have been scientifically inspected in this manner, and the result has been, from the Department's point of view, satisfactory. There is no disputing the results when obtained in such a manner—the ocular evidence is irrefutable and the Inspector's position vastly strengthened. Moreover, the directors of a company are able to prove to their shareholders how the deterioration in the quality of their factory's produce and the financial loss thus brought about takes place.

Such a loss would be cut out and recovered by the building of a new factory, situated in a more convenient and sanitary position, on up-to-date lines. The cost of building and equipping at the present time may seem hard to bear, but the ultimate cost is less than the loss, year in and year out, of several shillings per cwt. on the selling price of the butter manufactured. Lifting the quality of the butter by a few points means obtaining bigger returns. Take, for instance, a factory with an output of 35 tons of butter per week. If an extra 3s. per cwt. is obtained, it means over £100 per week extra revenue, and it does not take many years at that rate to pay for a modern, well-equipped factory. This lesson has been proved and demonstrated by the Manning River Co-operative Dairy Company. The quality of the butter now put on the market by that company is so improved as to be incomparable with that manufactured under the old conditions. It was proved at the same time that a saving of some £14 per week in labour was effected. In the modern, well-equipped factory nine men, working ordinary time, handled a much greater output than was done under the old conditions with thirteen men, often earning overtime rates of pay.

The manufacture of butter may be described as a fermentative industry, the flavour being due to the absorption by the fat of certain aromatic substances produced during the acid fermentation of the lactose of the milk or cream by *Bacterium lactis acidi* and related organisms. Most of the abnormal flavours are due to the replacement of the desirable acid-forming bacteria with other types of micro-organisms. Hence, to control the flavour of the butter the butter-maker must control the bacteria in the cream that cause the ripening.

As it is freshly drawn from the normal udder of the healthy cow, milk contains bacteria in greater or lesser numbers, the initial contamination taking place in the milk cistern and larger milk ducts of the udder. These organisms appear to cause no change in the market value of the milk, or in the persons drinking the milk. If, however, the cow is suffering from disease in the udder, such as tuberculosis, mammitis or other inflammatory trouble, the milk may contain many millions of the specific bacteria at the time when it is drawn. The extent of all subsequent contamination is dependent upon the manner and care with which the milk is produced and handled. The atmosphere, utensils, milking machines, and the milkers themselves add many bacteria; their future development is largely dependent upon the temperature at which the milk is kept.

Most micro-organisms find in milk an ideal culture medium for their growth. The food elements such as protein and milk sugar, being in liquid form, are most easily attacked, and it is the breaking down of these, by bacterial enzymes formed, which cause most of the undesirable changes. The cream of milk, whether separated by gravity or by means of the separator, will contain considerably more bacteria per unit volume than the milk. The tiny fat globules passing through the milk serum carry mechanically many bacteria of the milk into the cream, which on arrival at the butter factory and often only a few hours old, is in many cases

badly contaminated with bacteria. Experience teaches that such contamination can be avoided by efficient pasteurisation (and, if necessary, by neutralisation of excessive acidity) combined with the after-use of a pure culture starter. At the several butter factories visited, all samples were collected with sterile instruments and placed in sterile vessels, and the plating was carried out within half an hour of collecting the samples.

In the case of example No. 1, an upstairs room in the factory was selected as the most suitable of those available, and although the conditions were not comparable with those of the laboratory, every precaution was taken to prevent undue contamination. The poured plates, with suitable dilutions of the various samples, were kept at 30 deg. Cent. for four days, when counting of the bacterial colonies was commenced, and the organisms were isolated in pure culture and classified according to their action on litmus milk, gelatin, glucose and lactose broth. Smear preparations from the different colonies were stained by Gram's method for microscopic examination. The media used for plating were ordinary agar, glucose agar, litmus lactose agar, an acid agar specially suitable for the development of moulds, yeast, &c. Samples were also inoculated into peptone water containing bile, salt and glucose, for the ready determination of gas formers. All media were prepared at the Biological Laboratory, Sydney, by Mr. W. J. Reay. Assistance was also given by Mr. W. A. Birmingham in determining mould growths.

TABLE I.—Showing Numbers and Kinds of Micro-organisms found in 1 Gram (1 c.c.) of the following samples.

| — | Total Micro-organisms. | Gelatin Liquefiers and Casein Digesters. | Acid and Acid Coagulating. | Acid and Gas Formers. | Alkaline and Inert. | Yeasts. | Oidium | Moulds. |
|---|---|---|---|---|---|---|---|---|
| (H2) Cream before pasteurising .. .. | 162,749,000 | 770,000 | 160,250,000 | 1,840,000 | 50,000 | 3,000 | 6,000 | 10,000 |
| (J1) Cream immediately after pasteurising .. | 24,700 | 200 | 24,400 | .... | 100 | .... | .... | .... |
| (K1) Cream twenty hours after pasteurising .. .. .. | 1,296,500 | 543,500 | 380,000 | 1,000 | 367,000 | 3,000 | 2,000 | .... |
| (L) Butter in churn before salting .. | 443,900 | 100,000 | 310,000 | 600 | 32,000 | 300 | 1,000 | .... |
| (M1) Butter in box after packing .. . | 2,244,000 | 724,000 | 1,330,000 | 1,000 | 150,090 | 10,000 | 10,000 | 20,000 |
| (N) Butter-wash water.. | 329 | 27 | 11 | .... | 280 | 2 | .... | 9 |
| (O1) General service water (town supply) | 2,409 | 730 | 300 | 5 | 1,230 | 44 | .... | 10 |

*Sample H2—Cream before Pasteurising.*—Before pasteurising, and after thorough mixing in the 300-gallon cream-receiving vat, the cream was collected by means of a sterile pipette; it was received at the butter factory in cans from the surrounding dairy farms, and its acidity was determined at 0·6 per cent. of lactic acid. The plates showed the presence of a total of 162,749,000 micro-organisms; of these, 1,840,000 were organisms of the *Bact. Coli* group, or undesirable lactose fermenters, of which three varieties were isolated, viz., *Bact. Coli communis, Bact. acidi lactici* and *Bact. lactis*

*ærogenes.* Their presence in cream is evidence also of a proportion of volatile acids (acetic and formic), so the 160,250,000 true lactose fermenters, *Bact. lactis acidi* type, were not entirely responsible for the acidity of the cream. Amongst the 770,000 gelatin liquefiers and casein digesters, were *Bact. prodigious*, a species of the *proteus* group, and *sarcina lutea*, a liquefying micrococcus and cladothrix sp.; 19,000 micro-organisms, comprising species of moulds, oidium and yeasts, were counted, while the 50,000 bacteria causing alkalinity or no apparent change in litmus milk were both bacillary and coccal forms.

*Sample J*1—*Cream after Pasteurising.*—The cream was collected by means of a sterile pipette immediately after being discharged from the outlet pipe of the pasteuriser at a temperature of 180 deg. Fah. The sample was neutralised to 0·2 per cent acidity with lime, and pasteurised by means of the flash system, then cooled to 54 deg. Fah. by passing over pipe-coolers.

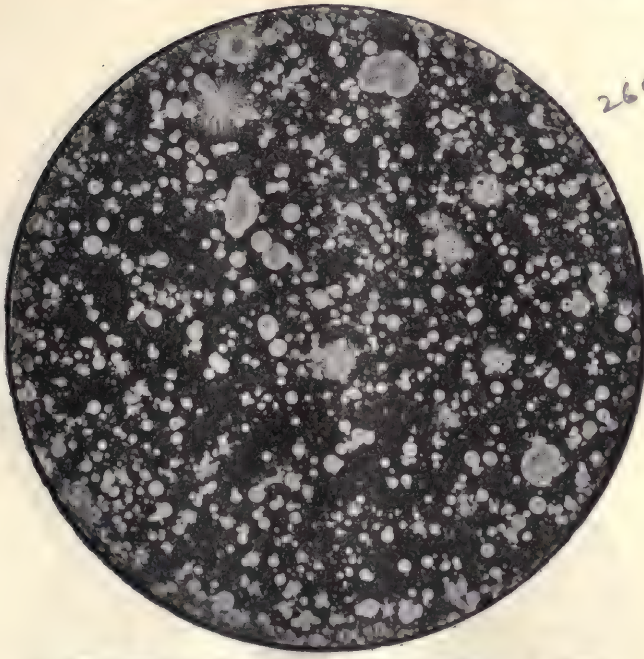
It has been seen from the figures in Table I that 162,749,000 micro-organisms in 1 c.c. of the cream were reduced by pasteurisation to 24,700. Of these there were 200 per c.c. gelatin liquefiers of the *B. Mycoides* type of spore-forming organisms. The remainder, 24,500 per c.c., were insignificant, inasmuch as only slight acidity, without noticeable taste or odour, was produced by them in litmus milk in three weeks.

*Sample K*1—*Cream immediately prior to Churning.*—After being pasteurised and pumped over the pipe-coolers the cream was gravitated into circular holding vats, each about 6 feet in diameter and 4½ feet deep, provided with semi-rotary pipe brine coolers. These vats were placed in a room about 12 feet wide by some 40 feet in length. The walls, which were of fibro-cement, were cracked, and broken, and dirty. The floor, also greasy and dirty, was of hardwood, badly jointed, and in places leaked through to the basement underneath. The beading round the bottom of the walls was loose and rotting, and the room was ill-ventilated and lighted, and generally in a state of disrepair and uncleanliness. The vats had open tops and the contents were exposed to contamination from the above conditions. No "starter" was added to the cream, which, pending churning, was held over-night (twenty hours) at 57 deg. Fah. Here the plates show that 1 c.c. of cream contained 1,291,500 micro-organisms; 180,000 of these were found to be desirable lactose fermenters or organisms of *Bact. lactis acidi* type and 1,000 were acid and gas formers of the coliform group, viz., *Bact. lactis ærogenes.* Amongst the 543,500 gelatin liquefiers and casein digesters were *Bact. proteus mirabilis, Bact. fluorescens liquefaciens, sarcina lutea,* and a gram-positive bacterium. The 367,000 producing alkalinity or no change in litmus milk were both rod-shaped and spherical forms, some being chromogenic. Two thousand colonies, comprising two species of oidium and 3,000 yeasts, were also counted; 200,000 micrococci were found to produce acid in litmus milk, but failed to coagulate it in ten days.

*Sample L*—*Butter in Churn before Salting.*—The cream from the attemperator or holding vats after cooling to 50 deg. Fah. was churned in a box churn for about thirty-five minutes, and the sample of butter for plating was collected

260

H2



**Agar Plate Culture of Cream before pasteurising (dilution 1 to 1,000), showing the extent of infection at the farm dairy.**

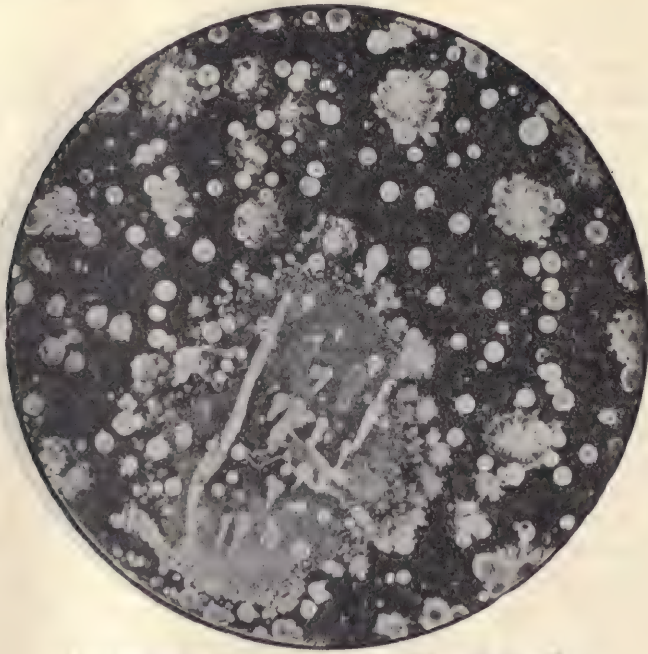
Total micro-organisms 162,749,000 per c.c. (Original.)

J1

**Agar Plate Culture of Cream immediately after pasteurising (dilution 1 to 100), showing beneficial effect of pasteurisation.**

Total count shows a reduction of organisms from 162,749,000 to 24,700. (Original.)

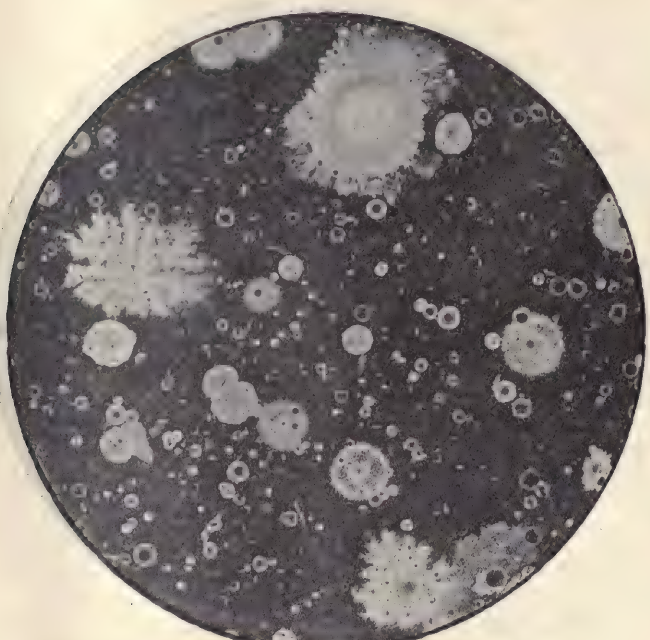
K1



**Agar Plate Culture of Cream before churning, twenty hours after pasteurising (dilution 1 to 1,000).**

Note the enormous increase of undesirable organisms, the result of contamination by factory conditions, which have nullified the benefits of pasteurisation. (Original.)

M1



**Agar Plate Culture, obtained from surface of butter in box after packing (dilution 1 to 1,000).**

Total count representing 2,244,000 micro-organisms per gram.

(Original.)

2602

B

D2

F

**Plates exposed to atmosphere inside factory for five minutes, showing growth of colonies of moulds, yeasts and bacteria, demonstrating the extent of infection from the interior of an old badly-planned factory.** (Original.)

B—Cream Attemperator Room. Media used, acid agar.
D2—Butter-working and Packing Room Media used, litmus lactose agar.
F—Butter Cold-storeroom, adjoining Butter-working and Packing Room.

O1

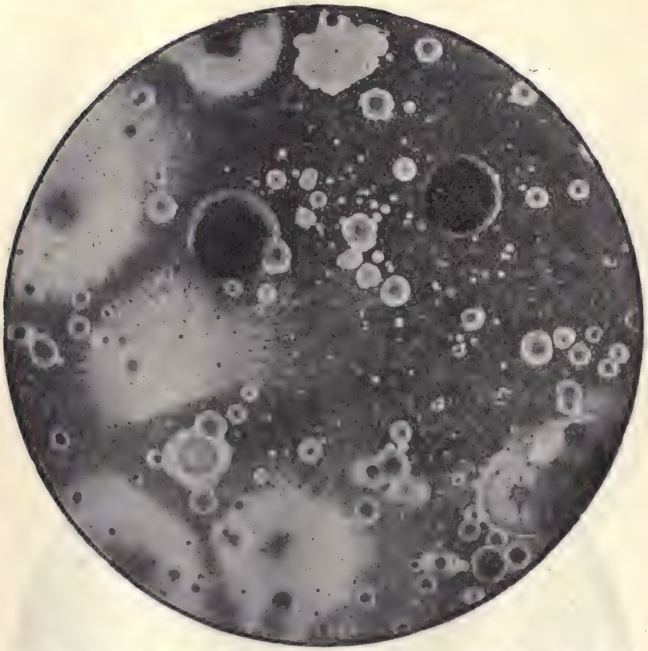


**Plate Culture of general service water from town supply used in the factory**

Total micro-organisms per c.c., 2,401. (Original.)

N

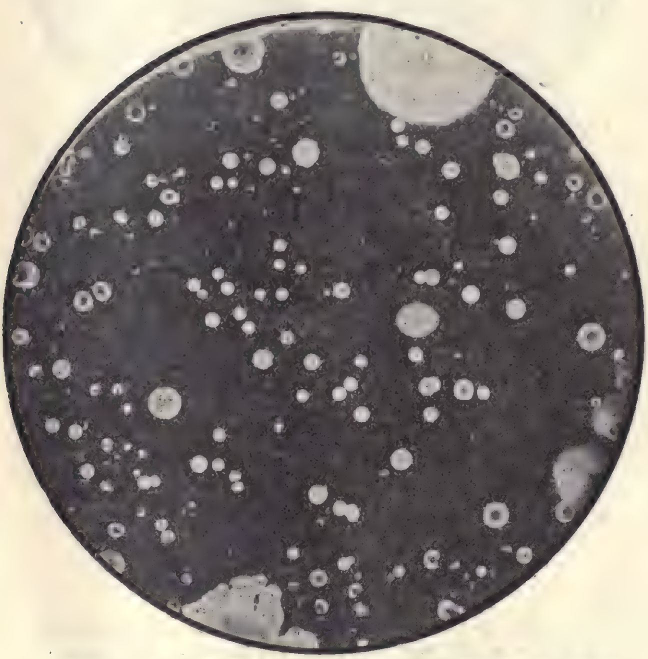


**Plate Culture of water used for washing butter. (Town supply, chilled to 40 deg. Fahr.).**

Total micro-organisms per c.c., 329. (Original.)

by means of a sterile measure before the addition of salt or preservative. From the plates it was ascertained that one gram of butter contained 443,000 micro-organisms. The majority of these, but considerably reduced in numbers, were similar varieties to those found in sample *K*1. From the figures in Table I it is seen that nearly two-thirds of the total micro-organisms in the cream before churning, were carried away with the buttermilk. The additional organisms appearing on the plates were *Bact. flucrescens non liquefaciens, Bac. fulvum* and a streptococcus, the probable source of all of which was the butter-wash water.

*Sample M*1—*Butter in box after Packing.*—After washing, the butter was removed from the churn to another room to be salted and worked on an ordinary 6-foot diameter butter worker (a circular table on which revolved corrugated or fluted rollers). The churn used, as already stated, was of the wooden box type, and of about 1,000 lb. butter capacity. The butter was handled from churn to barrow, from barrow to worker, and from worker to package by wooden shovels, and was packed into the latter by means of a wooden rammer. This is mentioned in view of these instruments being possible means of contamination. The sample for plating was taken with a sterile measure from (and near the surface of) the butter in the box. From these plates it was shown that one gram of butter contained 2,244,000 micro-organisms. Of these 1,330,000 coagulated milk with production of lactic acid, 1,000,000 were of the *Bact. lactis acidi* type and 10,000 a lactic bacillus of *Bact. bulgaricus* type and may be classed as desirable lactose fermenters, while 320,000 were streptococci, varieties of which are often associated with disease conditions. Amongst the 724,000 gelatin liquefiers and casein digesters, were present *proteus mirabilis, Bact. fluorescens liquefaciens, staphlococcus aureus, micrococcus flavus. Bact. Zopfii,* a variety of proteus which does not liquefy gelatin, was also present. One thousand undesirable lactose fermenters, *Bact. lactis ærogenes,* were found. The 150,000 making litmus milk alkaline were of both spherical and rod forms. The yeasts and oidium lactis numbered 20,000, while the 20,000 mould growths were *Cladosporium herbarum* and two species of *Penicillium.*

*Sample N—Butter Wash Water.*—The water used for washing the butter was obtained from the ordinary town supply, and was delivered into a large tank where it was subjected to a process of chilling before using. The sample for plating was collected into a sterile vessel from the delivery pipe in the churn room. From the counts it was found that 1 c.c. of water contained 329 micro-organisms; of these, twenty-seven, comprising *Bact. fluorescens liquefaciens, Bact. mycoides, Micrococcus flavus,* were able to liquefy gelatin and digest the casein of milk. There were five colonies of a micrococcus which produced acid in litmus milk but failed to coagulate it in three weeks, while six streptococci readily produced both acid and clot. Two hundred and eighty of the total bacteria in the water were inert or caused slight alkalinity when inoculated into litmus milk. There were present two colonies of pink yeast or torula, while the nine mould growths were species of *Cladosporium, Phoma, Penicillium, and Mucor.*

*Sample O1—General Service Water.*—The source of this water, as in the case of sample *N*, was the head waters of a coastal river. The water was distributed from a conveniently positioned reservoir by means of the ordinary system of mains and smaller pipes. The sample for plating was collected into a sterile vessel from a tap on the cream-receiving platform. From the counts, 1 c.c. of water contained 2,409 micro-organisms. Of these 730 were classified as gelatin liquefiers and casein digesters. They included *Bact. mycoides, Bact. pyocyaneous, Bact. fluorescens liquefaciens, Bact. proteus vulgaris*, and a large celled micrococcus. Of the undesirable lactose fermenters five colonies of *Bact. lactis ærogenes* were counted. There were 300 bacteria producing acid in litmus milk, while 100 of them were also able to coagulate it; 1,230 were determined as inert, causing no change, or only slight alkalinity in litmus milk in three weeks. Forty-four colonies of yeasts were counted, and there were also present 100 mould growths, comprising species of *Penicillium Fusarium, Cladosporium, and Papulospora.*

As noted, both waters were from the same source of supply. The difference in bacterial counts might be accounted for by the fact (*a*) that in still waters as in the case of sample *N* (butter wash water), suspended matter and bacteria having weight naturally gravitate to the bottom; (*b*) that a low temperature is injurious to many kinds of bacteria, even polluted waters showing a marked decrease of intestinal organisms if the sample is kept cold.

### Plate (A) Demonstrating Air Infection arising from Spray of Polluted Water.

A.—Poured plates of ordinary agar, litmus lactose agar and acid agar were placed on the edge of the cream-receiving vat; the lids were removed for fifteen minutes. After four days incubation, counting of the colonies was commenced.

The total bacterial colonies appearing on the agar plate was 4,800. Pure cultures were made of *Proteus mirabilis, Bact. fluorescens liquefaciens, Bact. lactis ærogenes, Oidium lactis, Bact. aurantiacus,* and several chromogenic micrococci. The colonies were too thick to enable the numbers of varieties to be counted.

The acid agar plate showed a total of 161 micro-organisms; fifty-four were mould growths as follows: Cladosporium sp. 29; Fusarium sp. 8; Aspergillus sp. 2; Penicillium sp. 8; Epicoccum sp. 4; Alternaria sp. 3. There were also counted 102 colonies of yeast and 5 *B. subtilis.*

It will be noted that in this case the cream-receiving vats were adjacent to the condenser tower (about 25 feet distant), the water flowing over which was pumped from a shallow stagnant lagoon adjacent to the factory premises. A favourable breeze would carry a fine spray of this polluted water through the factory. Then, since the diameter of the culture plate is 3½ inches, into which at least 4,961 micro-organisms had fallen in fifteen minutes, some idea might be gained as to the extent to which cream and butter is subject to contamination with undesirable organisms from such a source.

PLATES (B, C, D, E, AND F) EXPOSED TO ATMOSPHERE TO SHOW EXTENT OF MOULD INFECTION WITHIN THE FACTORY.

B.—An acid agar plate exposed to the atmosphere in the cream attemperator room for five minutes, and after incubation for four days, developed a total of thirty-six colonies of micro-organisms. Of these, twelve were yeasts, three *Micrococcus rosens* T., one colony was of a sporing bacillus, while the twenty mould growths were as follows:—Cladosporium sp. 9; Aspergillus sp. 2; Fusarius sp. 1; Spicaria sp. 6; Cephalosporium sp. 2.

C.—An acid agar plate exposed to the atmosphere in the churning room for five minutes developed thirty-nine mould growths and four colonies of yeast. Following are the moulds:—Cladosporium sp. 23; Penicillium sp. 12; Epicoccum sp. 2; Aspergillus sp. 2.

D.—Ordinary agar plate exposed to the atmosphere in the butter-working room for five minutes developed a total of thirty-two colonies of micro-organisms. Seven of these were mould growths comprising species of Cladosporium and Epicoccum. Eleven were yeasts, while the fourteen bacterial colonies were *Sarcina aurentiaca, Micrococcus rosens*, a sporing bacillus and Cladothrix sp.

E.—Glucose agar plate exposed for five minutes to the atmosphere in the storeroom for empty boxes, butter-paper, salt, &c. The total count of micro-organisms was thirty-four. Twenty-one of these were mould growths comprising species of: Cladosporium, Alternaria, Penicillium and Epicoccum. Three colonies of yeast were counted, while amongst the bacterial colonies were *Staphlococcus albus*, Sarcina and Cladothrix sp.

F.—Ordinary agar plate exposed five minutes to the atmosphere in the cold room. The total count of micro-organisms was forty-eight. Thirty-eight of these were mould growths comprising species of Penicillium, Alternaria and Cladosporium. Two colonies of yeast appeared, one Cladothrix sp., three *Bact. subtilis*, and three yellowish slimy colonies of a gram-positive bacterium which rapidly liquefies gelatin.

## Summary of Results.

The large numbers of undesirable organisms found in the cream before pasteurising suggests unsatisfactory and unclean conditions on at least some of the dairy farms. Pasteurisation effectively destroyed all vegetative forms of undesirable organisms. The holding of the pasteurised cream in open vats, exposed to the air and dust of an old factory with insanitary surroundings is disastrous, seeing that from the plates over half a million per c.c. of undesirable organisms were added in twenty hours. These would be sure to exert their deteriorating influence upon the good-keeping qualities of the butter.

The system of working and salting butter on an open worker facilitates the inclusion of many bacteria, moulds, oidium, and yeasts.

The plates, poured with the waters used at the factory, suggests that bacteria are reduced in numbers by chilling to 40 deg. Fah. The atmospheric

exposure plates indicate plainly the amount of re-contamination that took place from exposure of the cream and butter to the conditions and surroundings of these old and (in a hygienic sense) badly constructed rooms. They also point to the advisability of doing away with all overhead obstructions (beams, pipes, belting, flat ceilings, &c.) that collect or distribute dust.

The presence of such large numbers of undesirable water bacteria as those shown in the plate exposed over the cream-receiving vat (adjacent to the water-spray tower), and in subsequent plates of cream and butter, indicates the danger incurred in exposing cream and butter to outside influences—in this case arising from the infection constantly being carried into the factory by the spray of the condenser water tower, the source of supply for which came from the stagnant lagoons described above. The necessity of draining all such stagnant pools and lagoons cannot be too strongly emphasised.

## Sales of Pure-bred Dairy Cattle.

An auction sale of stud dairy cattle is to be conducted at Hawkesbury Agricultural College, Richmond, on Tuesday, 20th April, commencing at 1 p.m., when the thirty-four lots offered will include twenty pure-bred Jersey cows, five heifers, two bulls, and two pure-bred Red Poll cows, two heifers, and three bulls. A train is timed to leave the Central Station, Sydney, for Richmond at 8.56 a.m. on the day of sale, and buyers will find city-bound trains timed conveniently for their return the same afternoon. Prospective buyers wishing to inspect stock before the sale will be afforded every facility.

The same auctioneers will also offer for auction a number of pure-bred Milking Shorthorn stud cattle at Berry Experiment Farm at 1 p.m. on Friday, 16th April. Trains will leave Sydney for Berry as follows:—Thursday, 15th April, 4.45 p.m.; Friday, 16th April, 8.20 a.m. A return train will leave Berry at 4.25 p.m. on the day of the sale.

Catalogues and further particulars of both sales can be obtained from Messrs. Wm. Inglis and Sons, Ltd. (auctioneers), the Principal of the College, or the Under Secretary and Director, Department of Agriculture, Sydney.

## A Note on New Zealand Flax.

New Zealand flax, a plant that grows extensively in the country from which it derives its name, is cut for its fibre, which is used for making binder-twine, rough rope, &c. It grows only on waste land and is not a profitable crop on land that can be used for dairying or other purposes.

The plant is not widely grown in New South Wales, and before undertaking its cultivation a local grower would have to arrange for the expensive machinery necessary for its treatment. The flax cannot be cut until the plants reach the age of three years, and the yield under favourable conditions is from 800 to 1,200 lb. per acre.—A. H. E. McDonald, Chief Inspector of Agriculture.

# St. John's Wort and its Effects on Live Stock.

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Veterinary Pathological Laboratory, University of Sydney.

THE spread of St. John's Wort and the danger threatened to the pastoral and agricultural interests in the localities affected, has lately been the subject of considerable correspondence in the press and discussion amongst farmers and graziers. I am informed that the Federal Bureau of Science is making inquiries as to the advisability of introducing insect enemies of the plant; but it would appear that with the exception of one district in New South Wales, the evil is still regarded as a negative one, and St. John's Wort is still viewed purely as a weed—that is, as an undesirable plant the economic value of which is low or nil, but which, by virtue of certain characteristics, is able to crowd out more profitable growths.

With the exception of some of those in the locality referred to, graziers seem to regard the plant merely as a nuisance. Those excepted, however, have been taught by first-hand experience that St. John's Wort is more than that. They know that eaten by stock it may, under certain conditions, produce very profound disturbances to health—perhaps not very frequently ending in death, but seriously affecting the value of the wool in the case of sheep and the hides and milk in the case of some cattle. In both sheep and cattle the value of the carcase suffers on account of the loss of condition, &c.

It is with the object of bringing forward this aspect of the question that the writer has conducted experiments with the plant and collected information concerning its action in this State.

### Other Records of the Plant's Ill-effects.

For a botanical description of St. John's Wort, the reader is referred to an article by Mr. J. H. Maiden in the *Agricultural Gazette*, Vol. xxviii, part 6, p. 413. At present the plant occupies a relatively small area in the State, and vigorous action—not the mere discussion of what should be done and the passing of regulations without doing anything further—should check its spread (if not completely eradicate it) at a cost which would be small compared with the increasing losses sustained by depreciation of the market value of the infested land, and the injury to live stock wherever the weed gains a foothold. In the district referred to in this article, the writer is informed that the plant has been officially declared a noxious weed and nothing further has so far been done. It should be recognised, however, that the task of getting rid of the plant is by no means a simple one. Burning off or mowing appears merely to stimulate it to more vigorous growth, while (as anyone who has seen the root system of an old plant will realise) a single ploughing or hoeing up, and then nothing further, is only waste of time and labour.

The injurious effects on live stock (horses, cattle, sheep, and goats) as a result of eating St. John's Wort have been noted on a number of occasions, and for extracts concerning these the writer is indebted to an article by T. B. Rogers, D.V.S., entitled "On the action of St. John's Wort as a sensitising agent for non-pigmented skin," *American Veterinary Review*, November, 1914. It has been recorded as affecting animals in various parts of the world, viz., Tunis, Asia Minor, Southern France, Italy, and the United States of America. In Tunis (where the plant is known as "hamra") and in Italy, special reference is made to its effect on sheep. This is of interest, as experiments I have conducted in this State were carried out with sheep. It was also observed in those countries that only white-fleeced sheep suffered from the effects of eating the plant, whilst those with black fleeces entirely escaped. Indeed, it is stated that for this reason black sheep only were pastured in the neighbourhood of Taranto, where St. John's Wort is very prevalent.

C. Baillet recorded in 1862 that feeding experiments were attempted with St. John's Wort at Toulouse on sheep, as it was considered that the plant was causing injury to animals grazing on it, but the experimental animals would not eat it unless very hungry. The results were negative; but the experiments were made on permanently stabled animals, which were thus kept in a shaded place. In Tunis, where the condition resulting from eating this plant has been known for some years, it was found that stabling or other protection of the animals from direct sunlight was quite sufficient to prevent an attack or to check it. The Arabs use solutions of tobacco or henna to protect sheep; this stains the skin and appears to render it less permeable to sunlight. In North America St. John's Wort was considered to be the cause of eruptions on cows' udders and the lower extremities of the limbs of white-haired animals. It is also stated that one horse died from the effects of eating St. John's Wort, and that two in the same mob were killed in order to prevent further suffering. Steel, in 1893, quoting from "Monell in the American Shepherd," attributed to St. John's Wort, irritation of the skin in sheep, sometimes extending over the whole body and legs. He considered that if eaten *in too large quantities* it produced enteritis, fatal in lambs and sometimes in adults, denoted by fantastic capers and various other peculiarities in behaviour.

With regard to the symptoms seen in horses, it would appear from various writers that they are more serious than those observed in sheep, the symptoms in the former being loss of appetite, debilitated and dejected appearance, staggering gait, dullness of senses, and injection of mucous membranes. The animals assume various positions and finally become comatose. The white parts of the skin redden, swell and itch, and the animal bites and rubs at them until they are quite raw. The interesting feature of the condition as it affects any species of animal is that symptoms only become evident when the animal is exposed to full sunlight, and only in animals having unpigmented or only lightly pigmented skin.

The chief constituents of St. John's Wort are a volatile oil, a resinous substance, tannin and colouring matters; alcoholic extracts are a deep red

to chocolate colour, and watery extracts are a yellowish red. The cause of the trouble in animals is said to be a red fluorescent substance which renders the skin very sensitive to light. The usual colouring matter or pigment in skin is able to protect it against the injurious action of the sun even though it is sensitised by the substance mentioned, but unpigmented or white skin being devoid of such protection suffers accordingly. Other plant substances than St. John's Wort produce this peculiar sensitisation of unpigmented skin to sunlight, for example, certain clovers, buckwheat, and the common wild trefoil so prevalent in parts of New South Wales. For detailed reference to the latter the reader is referred to an article by the writer (S. D.) in the *Journal of Comparative Pathology*, entited "Trefoil dermatitis, or the sensitisation of unpigmented skin to the sun's rays by trefoil (*Medicago denticulata*)." It would appear that the condition produced by these plants as the result of their ingestion may be referred to the presence in them of an agent, in some cases still undetermined, which reacts to sunlight. It is evident, however, that the condition produced by St. John's Wort is far more severe in its systemic and local effects than that induced by the other skin-sensitising plants.

The infested area in New South Wales which occasioned this article is about 5,000 acres, with a few other small scattered areas throughout the same district. The pest has been known in the locality for about twenty or thirty years and is slowly spreading. The larger area mentioned is now thickly infested. Some of it is in very hilly country where it would be difficult to deal with; but a good deal is in cultivated situations, where some owners are trying to eradicate it from their land whilst neighbours are doing nothing. In other places, again, it is seen along watercourses or on the sides of roads.

Stock usually are reluctant to eat it and will only readily do so when there is little else to eat; though when the plant is young and before flowering they appear to have less objection to it. This is confirmed by the feeding experiments to be referred to later. The condition resulting from feeding on St. John's Wort is seen at any period of the year, but the plant appears to produce its greatest effects when in the flowering stage. Some state that when it is young, animals eat it with impunity. It is also stated that with sheep, if they eat only a small proportion of the plant in its flowering or most active stage, with plenty of other grasses, no ill effects are observed. My experiments, however, show that an amount small in proportion to the daily weight of food consumed by a sheep will, if eaten daily, produce pronounced symptoms. In the district referred to, the animals principally affected are sheep and cattle, but very occasionally horses also suffer. It is stated that human beings have developed sores on their legs after walking through a paddock containing St. John's Wort, and on their hands after handling the plant. In view of the mode of action of the plant these statements require more evidence before St. John's Wort can be accepted as the cause of the trouble. The view that animals become affected merely by contact with the plant and not by eating it also needs confirmation. Animals of any age are affected.

In naturally occurring cases cattle show symptoms of trouble about two weeks after commencing to eat the plant. One stockowner says that sheep will begin to show signs within forty-eight hours of being turned into an infested paddock. In experimental feeding, as will be shown, the earliest symptoms were observed in thirteen days; but during the time over which the experiments extended there were a good many dull days, when very little sunshine was seen. This may perhaps account for the more lengthened period, although dull days should not interfere with the process of sensitisation, but only with its manifestation.

### Symptoms observed in the Field.

*Cattle.*—In the initial stages the animal shakes its head violently, and frequently the whole body in the same manner, as if to remove some irritating body. It scratches at its head and other parts of the body with its hoofs, rubs against posts, &c., and at times races about the paddock just as cattle do when attacked by warble flies, although those flies do not exist in the locality referred to. Before long the animal commences to lick itself on the white-haired places, and very soon this hair is removed and there remains a raw surface. The affected skin swells and becomes very reddened; the nostrils, when not pigmented, swell up and become covered with scabs, which also form over all the excoriated surfaces after a time. The itching of the skin is sometimes so intolerable that the animal appears to go mad, rushing into waterholes where it tries to bury itself in the water or mud in the endeavour to relieve the irritation.

*Sheep.*—There is considerable reddening and swelling of the skin in general, followed by an exudation of plasma or the fluid portion of the blood. This coagulates in clear yellowish masses, often matting the wool together. The animal bites at its skin on account of the itching, or rubs itself against solid objects, and the wool is removed, particularly on the legs, face and loins, these places becoming quite raw and eventually scabbing over. The eyes, ears, lips and nostrils swell up considerably and become covered with scabs, and the ears may become torn into shreds on account of the rubbing by the animal. The eyes are affected in some instances, the cornea becoming opaque; at times total blindness results. Some animals may be seized with a fit, leap up into the air and roll over and over. Certain sheep die very soon after such acute convulsive symptoms are shown, but the majority do not succumb, though they become very poor. In both cattle and sheep loss of condition is a very observable feature; in milking cows there is total suppression of milk; and in sheep the interference with the normal growth of the wool seriously lowers the value of the fleece.

*Horses.*—Not many horses have been observed affected, and such as were showed evidence of it only on parts covered with white skin, generally on the hind legs. Sores are said to break out between the coronet and fetlock. In all animals markedly affected there is great mental depression, the animals being said to mope. The main symptom, however, is itching, and this is always present. There is no doubt that this has given rise to the

local view that the animals become affected by contact with the plant. The excoriation, &c., is no doubt due to the attempts of the animal to obtain relief from the intolerable itching which, as before remarked, may be so great as to cause it to become temporarily demented.

All affected animals after removal from an infested paddock and being placed in a clean one soon recover general health, but the damage to the skin and wool is not so readily remedied. The writer has had an opportunity of personally inspecting a number of animals suffering from the result of eating St. John's Wort, but as the cases are all very similar, varying mainly in degree, it will suffice to note here two typical cases—one a sheep and the other a cow. The sheep had been affected a considerable time; its condition was very poor, its fleece ragged, and the animal showed great mental depression. On both sides of the loins were two areas, about 8 by 6 inches each, quite devoid of wool and covered with scabs. Practically the whole of the flexor surfaces of the fore and hind limbs were bare of wool and covered with scabs. The ears were in ribbons, greatly thickened, ulcerated and had large scabs. One eye was blind, and the whole of the face, including the nostrils, was swollen. The skin of the face was partly raw and partly scabbed over.

The cow was red in colour, patched with white. Its condition was very poor, but the animal exhibited no pronounced depression. The disease had been in existence some six weeks. The hair was removed from all the white patches on the upper surface of the body, but on the under surface of the abdomen the white areas appeared to be normal. Portions of scabs were scattered over the excoriated surfaces, and the nose was swollen, excoriated and scabbed. No coloured parts of the skin were affected; the udder was considerably reddened, but showed no raw parts at the time of examination. The flow of milk was entirely suppressed.

### Feeding Experiments with St. John's Wort.

Owing to the scepticism expressed by a number of stockowners and others as to the injurious effects produced by St. John's Wort as the result of feeding upon it, the writer decided to conduct feeding experiments at the University Veterinary School, the Chief Inspector of Stock, Mr. S. T. D. Symons, kindly arranging to supply fresh plants weekly. The first experiments were begun in April, 1919. Two sheep were fed with an unlimited amount of the plant, which at that period of the year was very old, fibrous and dry. The animals were very reluctant to eat any of it, even after it was chopped up and mixed with other fodder.

Twenty-three days after commencement of feeding, one sheep, a Lincoln crossbred, was observed biting at its loins and rubbing its face and sides vigorously against the posts of the pen. During the next few days the animal's fleece appeared ruffled in various places and the animal was seen several times with tufts of wool in its mouth which it had torn out in biting. Locks of wool were matted together by an exudate, but no changes were seen in the skin itself. On the twenty-eighth day the second sheep, a

Merino, showed distinct reddening of the unprotected pink portions of the skin, notably on the nose and face, but no signs of general irritation.

The feeding was continued until the end of June, but although the Lincoln showed evidence of irritation by biting at its body and rubbing against solid objects, and the Merino by the marked reddening of the skin, no acute symptoms, such as are seen in the field, were evinced. During the whole of this period, however, there was comparatively little daily sunshine, and the weather was cold. Furthermore, the plants were old, and it was difficult to get the animals to eat them, even after starvation. It was therefore decided to discontinue the experiments until the following spring, when the plants would be young and succulent, and there would be more sunny days.

On 1st October, 1919, feeding experiments were recommenced. The plants were green and succulent, but had not begun to flower. The animals ate them quite readily, but no symptoms of irritation were shown until the thirteenth day, prior to which, however, the weather had generally been dull and overcast. Subsequent to this, owing to the Merino being wanted for another experiment, the feeding was confined to the Lincoln. On 13th October a consignment of the plant, which had commenced to flower, was received.

On the thirteenth day from the recommencement of feeding the animal was observed rubbing itself against posts, &c., and on the outside of each leg (on the forelegs just above the knee, and on the hind legs just above the hock) raw excoriated areas about 2 inches in diameter were noticed, the wool having been torn out as if by biting. Areas in the region of the axillæ and the flanks not covered by wool were distinctly reddened, and on the sides of the chest near the elbow there were a number of papules and some exudate of dried plasma. The irritation, or rather the sensitisation, appeared to be general, as the animal showed signs of gratification on being rubbed along the back, loins, &c. The following seven or eight days were cloudy and comparatively sunless, although hot. During this period the symptoms abated, and the raw surfaces scabbed over. On the twenty-third day and onward sunny weather became the rule, and symptoms gradually became more pronounced, until finally a typical picture such as is observed in the field was produced.

The condition became acute about three weeks after the beginning of feeding, and then gradually increased in intensity, until at times the irritation and mental depression appeared very pronounced. During dull days symptoms would disappear, only to reappear in all their intensity when the sun shone again. There was considerable abatement, if not entire absence, of skin irritation at night, as was shown by the fact that the raw surfaces would scab over during that period, only to be rubbed or gnawed afresh during the day. At daytime, considerable uneasiness was evinced by the animal scraping on the floor with its hoofs, frequently lying down and rising again soon afterwards, or wandering around the pen. At other times mental depression was the most pronounced feature, the animal standing with its head pressed against the bottom of the wall of the pen, and refusing

to move. An interesting feature in connection with this was that if the animal, whilst these mental symptoms were being shown, was placed in any other position for the purpose of being examined, it would make violent efforts to regain its original position, and when released would take up exactly the same attitude as at first. As the disease increased in intensity, the ears, nostrils, and around the eyes became greatly swollen, their surfaces being rendered quite raw by the continued rubbing against solid objects. The surfaces often bled freely, and later were covered with a crust of dried blood and serum, only to be removed again by rubbing or biting.

On the thirty-fourth day of feeding, the eyes, nostrils, and ears of the animal were swollen, and the former almost closed up; the wool had been removed from the skin in places, leaving raw ulcerated surfaces. The wool on the upper parts of the limbs had been removed by biting, raw surfaces, each about a handbreadth in area, remaining. Some of these were bleeding, others were covered with scabs; the wool along the back and loins (considerably matted together by exuded plasma) showed signs of having been rubbed, but there were no excoriated surfaces. The skin on the upper surface of the body was distinctly reddened and covered with small hard masses of dried plasma. Urination was very frequent and profuse, and mental depression very pronounced, the animal refusing to move except to bite or rub a portion of its body.

As the plant grew older, it became more woody and more distasteful to the animal, which ate very little at the last even when other food was withheld; the actual amount of plant consumed was determined daily, but it is not necessary to go into details here. The feeding was discontinued on the thirty-fourth day, as sufficient evidence for the purpose (that is, to convince stockowners of the injurious action exerted by St. John's Wort when eaten by animals) had been accumulated. Three weeks afterwards most of the wounds had healed up and only scars remained. There was, however, still some skin irritation—shown by the gratification of the animal when its back was rubbed and its habit of nibbling at parts of the skin, or even pulling small locks of wool out with its teeth or rubbing against posts, &c. About a month after cessation of feeding the plant, all symptoms had disappeared, and only the effects of the trouble remained, viz., scars where the wounds had been, ragged fleece, and poor condition of body. Two months later the sheep had entirely recovered, the only evidence of the former trouble being the appearance of the fleece, which would not regain its normal appearance, of course, until after the next shearing. It is to be noted that after the experiment was discontinued the animal was kept under exactly the same living conditions as those obtaining during its progress; that is, it lived in the open, was exposed to sunlight during the day, and was permitted to go under shelter during the night.

## Conclusions.

The experiments, of which the foregoing is a condensed account, confirm the deductions arrived at elsewhere, namely, that St. John's Wort contains a principle (most abundant in the flowers and flowering stems) which, when

the plant is eaten, becomes absorbed into the system and renders unpigmented or white skin peculiarly sensitive to sunlight, with the result that on exposure to the sun such skin is injured, as evidenced by the reaction described; the excoriation, bleeding, &c., and indirect results of the general injury being inflicted by the animal itself in the effort to relieve the intolerable itching. The reaction is much more than mere sunburn, especially as the condition is not seen in similar animals exposed to greater sunlight, but not fed on this or other skin-sensitising substances. The condition is quite comparable to that produced by feeding on trefoil previously described by the writer, save that the effects produced by St. John's Wort are far more serious than those seen in trefoil sensitisation.

Besides the skin affection, St. John's Wort appears to exert an effect upon the central nervous system, usually causing great mental depression, but at times an exactly opposite effect, that is, excitement which sometimes becomes almost mania.

There is no reason to doubt that pigmented skin is sensitised just as much as unpigmented skin, but the colouring matter in the former prevents the sun's rays from acting upon it and thus no injury results. This is shown by the fact that if unpigmented or white skin is stained or coloured, no reaction to that skin occurs, although the animal may be sensitised and it is exposed to sunlight.

So far as treatment is concerned, the only one of value is that of prevention. The foremost object should be the eradication, or where that is impracticable, the keeping within bounds of the cause—St. John's Wort. With horses and cattle on infested areas the trouble may be averted by treating the white parts with a dark staining liquid, which should be non-poisonous in case the animal should lick the part. With sheep, such a procedure would be complicated by the facts that—(1) the whole of the body would have to be treated: (2) the number of animals to be so treated would be large; and (3) the possibility of injury to the fleece. These considerations might find the proposition inpracticable. Whether the local treatment of the skin would prevent the brain symptoms or the injury to the eyes which often occurs are also matters of doubt.

## Correcting Acidity caused by Superphosphate.

Does the continuous use of superphosphate tend to sour the soil? This question was recently addressed to the Department by a Pokolbin orchardist and replied to by the Chief Inspector of Agriculture as follows:—

The continuous use of superphosphate will tend to increase the acidity of soil and may consequently be detrimental to its fertility, but the sourness can easily be remedied by the application of lime. Lime should be applied at the rate of 1 ton per acre about a month or six weeks before the usual time for applying the superphosphate.

# The Powder-post Beetle and its Parasite.

W. W. FROGGATT, F.L.S., Government Entomologist.

The members of the family *Cioidæ*, to which the powder-post beetle (*Lyctus brunneus*) belongs, are all small insects with short antennæ, the terminal joints of which thicken to a club. They have short feet composed of four joints, middle and hind pair of legs with coxiæ small and oval, and flexible abdominal segments. The larvæ are small, semi-transparent, slightly hairy grubs. The eggs are deposited in the sapwood of dead timber, or in fungi growing upon decaying timber. The typical genus *Cis* contains over a hundred species of tiny oval beetles breeding in fungi, and one of these, *Cis boleti*, is found all over Europe. Out of forty-two species of this family described from Hawaii, according to Perkins, twenty-nine belong to this genus, and are chiefly collected in the large fungi growing externally on trees or on dead bark, under which there are usually many small fungus growths.

The family is poorly represented in Australia. In Gemminger and Deharold's great "Catalogue of the Coleoptera," published in 1869, no species is recorded from Australia, and in Masters' "Catalogue of the Described Coleoptera of Australia" only one—our common powder-post beetle—is listed.

The members of the genus *Lyctus* differ considerably in general form from the fungus-infesting species, being elongate, flattened on the dorsal surface, with the thorax larger and squarer, and the divisions between the abdomen, thorax and head well defined. The adult beetles vary in colour from black to reddish-brown, most of them being about $\frac{3}{16}$ of an inch long.

### Timber Infested at an Early Stage.

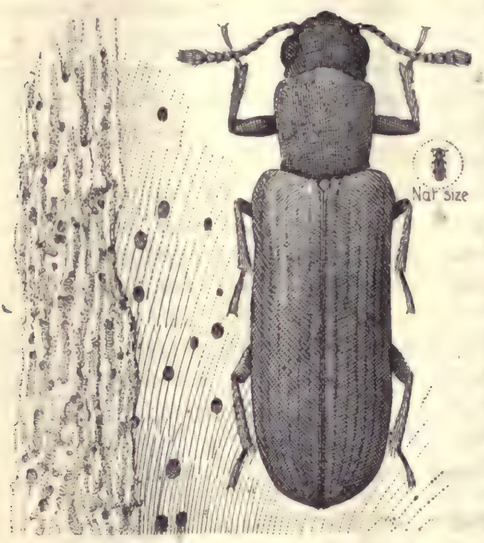
The female probably deposits her eggs in the outer surface or sapwood when the tree has been cut down and the bark is drying. This may happen in the forest if the logs remain there for any length of time, or when exposed in the mill yard. There is no question that the eggs or young larvæ are in the sapwood when the timber is sawn up and used for building purposes, though usually there is no evidence of their presence until about twelve months after the house has been erected. Then the householder notices little dabs of wood dust on the floor. If the boards along the skirting or wainscote are infested, these heaps will be very noticeable, and the little pinholes from which the wood-dust has fallen will be well defined. Sometimes this will end in a year, and there will be no further damage, the adult beetles emerging through the pinhole and dying outside. At other times generation after generation of active grubs are hatched out of eggs, evidently deposited by the adult females before they emerge from the infested timber or furniture,

and after a series of years the infested wood is simply reduced to a mass of wood dust, held together by an outer thin skin of wood perforated with fine holes. The larvæ of these beetles may be found in the timber in any part of a house where unseasoned wood (or sapwood) has been worked up in both soft or hard woods.

It is not uncommon to find them in furniture, and they frequently feed on the rattan and cane chairs, &c., imported from the East, reinfesting it for years until the whole structure is reduced to a shell, and finally falls to pieces.

### A Voracious Pest.

When sapwood has been used in making furniture, the entire piece is stained and varnished to a uniform tint, but on turning it upside down, one may often find the band of light-coloured sapwood riddled with fine pinholes, caused by the presence of these beetles. Large numbers of the wooden handles of picks, hammers, and axes are often found by storekeepers to be wasting away to dust, being often so far gone that there is nothing to be done but to remove and burn them.



**The Powder-post Beetle (*Lyctus brunneus*).**
**Also some damaged woodwork.**

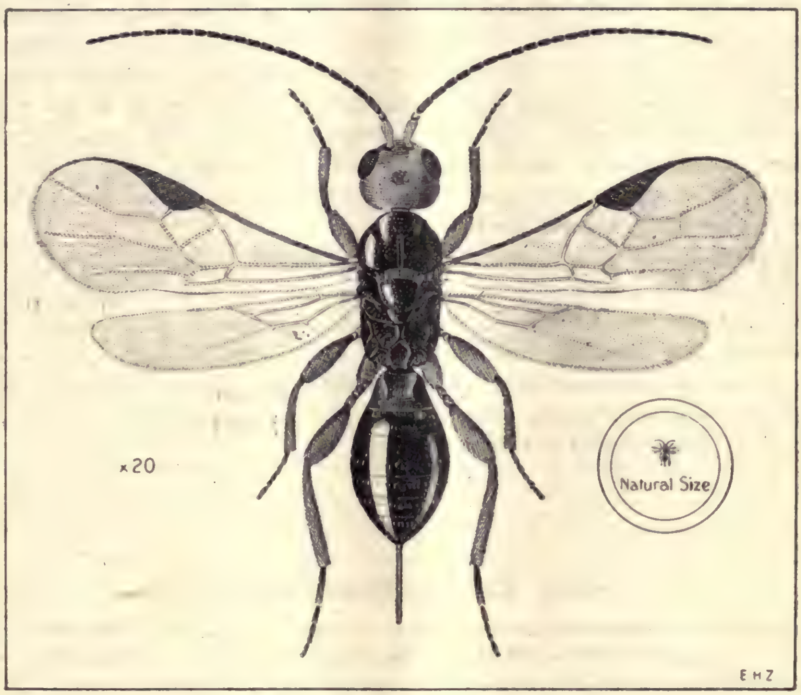
In most cases the adult beetles die when they emerge from the infested wood, but they have sometimes been found boring into new timber upon which they have flown or fallen. Borers were discovered at the great hall of the Fisher Library at the Sydney University soon after it was finished, and some fell on the varnished reading-desks below and bored their way into them. In this instance the powder-post beetles died out without doing any serious damage. In a large bonded store in Sydney, where the large beams under the floor were rounded joists, the outer sapwood began to fall away in flakes, and the owners found the beetles on the floors. When, at our suggestion, the sapwood was adzed away, and the rest treated with crude oil, the damage did not extend into the remaining timber.

### Range and Description of the Beetle.

Among the members of the genus *Lyctus* that have been recorded as powder-post beetles, *Lyctus unipunctatus* is stated to be the most common and destructive species in the United States. *Lyctus striatus*, another North

American beetle, did considerable damage to the red oak floors of Michigan College, while *Lyctus opaculus* bores into the stems and canes of the grape vines in some parts of the United States.

Though our powder-post beetle (*Lyctus brunneus*) was described at a very early date from specimens in England, and again under the synonyms of *L. cobydioides* Dejeen, and *L. glycyrrhizæ* Cheverolet, from specimens in France, and from Woodlark Island by Montrozier under the name of *Lyctus rugulosus,* it was not until 1876 that it was recorded and identified from Australia. In a note in the *Entomologist's Monthly Magazine* of that year,




**Braconid parasite of the Powder-post Beetle.**

J. W. Douglas contributed a note as follows: "In the year 1862, on a small log of wood with the bark on, imported into the London Docks from Swan River as a sample, I found five beetles of a species which has recently been identified as *Lyctus brunneus* by Dr. Sharp, who informs me that he has specimens of it from New Zealand, Britain and France, and it is recorded from Woodlark Island."

This beetle probably has a very wide range over the East, and has been casually introduced in most of these outside countries in timber or furniture. It may not even be a native of Australia, though it is well established here at the present time. It may be described as follows:—

General colour reddish-brown, sometimes dark brown; general form elongate, with the divisions between the head, thorax, and body well defined. Head not as broad as the thorax; jaws stout, turned down; eyes large, rounded, and projecting from the

sides of the head; antennæ with the terminal joints forming a club. The thorax is rather flattened on the dorsal surface, a little more long than broad, rounded on both the hind and front margins, and with sides straight, but sloping slightly to the hind margin, the whole surface being finely granulated. The wing covers are long and narrow, their front margin straight with tips rounded, and the surface finely granulated with fine parallel striæ. The hind pair of wings is well developed, for this little beetle can fly well. The legs are long, with slender tibiæ and long tarsi. Length, ⅛ of an inch.

### A Parasite on the Powder-post Beetle.

There has been no record, as far as the writer knows, of a parasite attacking or checking the increase of this very serious wood-destroying beetle; but early in 1919 a badly-infested board of "blue fig" was sent to this office from southern Queensland. It was full of fine pin-holes from which powdered wood-dust was falling. The board remained under observation for several months, when several adult beetles emerged, which proved to be the well-known *Lyctus brunneus.* The beetles first appeared on the surface of the board in May, and it was toward the end of the month, while collecting specimens of them, that their hymenopterous parasite was first noticed coming out of the holes in the board.

This Braconid wasp measures 4 mm. in length. The head is reddish-brown, and the antennæ (except the basal joints, which are reddish-brown), eyes, and area round the ocelli black. The dorsal surface of the thorax, the abdomen, and ovipositor are black, with a slight reddish-brown mottle on the thorax in some specimens, and the undersurface lighter coloured. The legs are a yellowish-brown, wings hyaline, and the costal nervure and stigma black, with inner veins of a lighter colour.

## Some Recent Publications.

Copies of the undermentioned publications may be obtained by farmers free of cost, on application to the Under Secretary and Director, Department of Agriculture, Sydney :—

Farmers' Bulletin, No. 129. The Beginner in Bee Culture. W. A. Goodacre, Senior Apiary Inspector.
Laying Out and Planting an Orchard.
List of Publications of the Department.
The Sowing of Wheat.
Some Points in Oat Growing.
The Farmer's Sheep.
Potatoes: If you grow them properly, they pay.
The Production of Citrus Fruits.

Diseases of Animals—

No. 4 : Blackleg.
No. 5 : Abortion.
No. 6 : Pleuro-pneumonia.
No. 7 : Fluke.
No. 9 : Inflammation of the Udder.
No. 10 : Ophthalmia.
No. 11 : Derangement of Digestive Organs of Horses.
No. 12 : White Scour in Calves.

# Cherry Growing in New South Wales.

W. J. ALLEN and S. A. HOGG.

The cherry is not a drought-resisting tree, and districts favoured with a fair average rainfall should therefore be selected for its cultivation. The growing of cherries in New South Wales is practically confined to the highlands as, although experiments have been carried out in the warmer districts, results have proved unsatisfactory, owing to the fruit growing in such districts becoming affected with "gum." This congestion of sap (caused by intense heat) ultimately kills the trees as a rule, most of them dying at the age of seven to eight years.

Cherry soils may vary in texture, but, generally speaking, the deep red loam produces the largest and best quality fruit. Good drainage is also most important. A loam overlying sand or rubble is preferred, providing sufficient moisture is retained. Shallow loam on top of clay should be avoided, and heavy clay lands have proved most unsuitable, owing to their lack of drainage.

## Planting.

In planting a cherry orchard, only one-year-old trees should be used, care being taken to see that the varieties selected have been worked on suitable stocks. The stocks used are either Kentish or Mazzard; some varieties do better on the former and some on the latter. If dwarf trees are required, Kentish stock should be used. The following varieties will be found to do well on the stocks bracketed beside them :—

| | |
|---|---|
| St. Margaret<br>Florence<br>Early Purple Guigne<br>Noble<br>Napoleon | Kentish. |
| Early Lyons<br>Eagle Seedling<br>Bedford's Prolific | Mazzard. |

Following is a list of selected cherries arranged according to their order of ripening :—Early Purple Guigne, Early Japonlay, Early Lyons, Black Republican, Bowyer's Early Heart, Black Tartarian, Governor Wood, Bigarreau de Mezel, Blackpost Bigarreau, Black Eagle, Florence, St. Margaret.

## Canning.

Cherries are largely used for canning; the varieties selected for this purpose should be firm, light in colour, and large. Florence is one of the best canning cherries. Although most of the Kentish varieties of cherries are small, they are sometimes preferred for canning because of their aromatic and sub-acid flavour. Cherries are also used for making jams, jellies, and liqueurs.

### Pruning.

Except to form a head, the cherry is not generally pruned; when necessary to shape or balance a tree, it is found that the best plan is to pinch back the young shoots. In the cool districts, if trees in bearing are pruned in the winter, little or no bad effect takes place; but in the warmer districts, winter pruning is apt to cause gumming, from the effects of which the trees die in a few years.

### Fertilisers.

Generally speaking, the cherry requires as little fertiliser as any fruit grown. An occasional crop of black tares, grown in the winter and ploughed under in the spring, will be found beneficial.

The mineral constituents of the cherry are: potash, 51·85 per cent.; soda, 1·12; magnesia, 5·46; lime, 7·74; phosphoric acid, 14·21; sulphuric acid, 5·09; and silicic acid, 9·04.

Phosphoric acid, potash and lime are the chief ingredients taken from the ground, and are therefore those that need to be restored. Several useful fertiliser mixtures for cherries will be found in the leaflet "Fertiliser Mixtures for the Orchard," copies of which are obtainable free on application to the Department.

### Cultivation.

The cherry is not a very long-lived tree (the hardy varieties living from thirty to forty years) excepting under very favourable conditions. It is advisable to subsoil the land before planting. The trees should be planted from 20 to 24 feet apart, according to the richness of the soil. Trees on rich soil grow vigorously and to a good size, and therefore require extra space to accommodate their branches. The land should be ploughed at least once a year, cultivating from time to time so as to conserve moisture and prevent the growth of weeds.

### Picking and Marketing.

Many varieties of the cherry are most delicate and very susceptible to injury, and the fruit must therefore be handled carefully; it should be gathered with the stalk intact, separating it carefully from the spurs or branches, as it keeps much better with the full stalk. The fruit should be gathered when dry and cool, and under rather than over ripe, and the bloom should be preserved on varieties which show any. The proper way to handle the fruit is by the stems. Varieties which bruise easily should be picked into shallow baskets holding about 10 lb.; kerosene tins which have been cut in halves for the purpose have also been found suitable. Care should be taken to see that the fruit spurs are not broken off at the time of picking.

The case which finds most favour with both growers and buyers is the 12 lb. case. At the time of packing, all stemless cherries should be rejected, and the top layer of fruit faced in rows with the stems hidden. This work can be done best by women and girls, who lay the cherries on the bottom of

the box in rows, fruit side down; then fill the box, nail on the bottom, and either turn over and mark the faced side as top, or stencil the case so that the properly-faced side will be opened, showing the cherries neatly rowed and presenting a very attractive appearance.

## Diseases of the Cherry.

*Cherry Tree Borer* (Cryptophaga unipunctata, Don).—When a tree is found to be attacked by these grubs, remove all the felted web, and insert a bit of copper-wire into the burrow so as to injure the grub; if this cannot be managed, squirt a little kerosene oil into the hole and then plug it up. Some growers have found that dipping a wooden plug in kerosene and then driving it into the hole kills the grub.

*San José Scale.*—For this, spray (after the fruit is harvested) with resin, soda and fish oil in the summer, and lime-sulphur solution in the winter.

*Rutherglen Bug.*—As this bug attacks the ripe fruit, we have been unable to find anything to keep the trees free from it without at the same time damaging the fruit.

*Pear Slug.*—Spray with arsenate of lead (2 lb. to 50 gallons of water). Where the slug is found to be very destructive to the foliage, it is advisable to disturb the soil round the trunks of the trees, or apply lime so as to destroy the cocoons in the ground.

*Brown Rot.*—For brown rot spray with Bordeaux mixture or lime-sulphur (winter strength) when the buds are swelling, and again with Bordeaux mixture (summer strength) when the fruit has set.

*Shot-hole Fungus.*—This disease attacks the leaves, showing first as brown dots and later as small, round, dry patches, which fall out leaving a round hole. Spraying with Bordeaux mixture or lime-sulphur in the winter is recommended.

*Gumming.*—Gumming may result from either excess of, or want of, water in the soil; also from intense heat or heavy pruning. It is therefore not in itself considered a disease, but rather an indication of conditions unfavourable to the thrifty growth of the tree. The presence of gum is usually the beginning of the end, but some check may be given by opening the bark in the spring, inserting the blade of the knife lightly under it and making the incision from the base to where the first limbs branch out.

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"WILL you kindly forward me your book on the cultivation of maize. As I go about I see better crops than I can raise and I am anxious to discover the reason."

The foregoing reached the Department in a recent mail—surely the spirit of the New Agriculture!

# Notes on the Dicky Rice Weevil

(*Prosayleus phytolymus* Olliff).

L. GALLARD, Fruit Inspector.

DICKY RICE Weevil (*Prosayleus phytolymus*) has been a serious pest in our orchards and nurseries for the last fifteen years, but so far it has baffled all attempts to find its larvæ. As the weevil although only about one-twelfth the size, is very much like *Leptops hopei* in form and habits (see "Notes on the Apple Root Weevil," by W. W. Froggatt, F.L.S., in the January *Gazette*), the idea occurred to me that probably the larvæ would also be similar. On 30th October, 1919, Mr. F. Spurway, of Ermington, gave me permission to search for larvæ in an old discarded bed in his nursery. I tried digging round the young trees and examining the soil carefully, but failed to find any larvæ. However, I collected a number of adult weevils and took them home. These I put away in a tube in which I had placed some soil, to try and get them to lay eggs, with the hope of securing the larvæ in that way. After about four days they laid quite a number of eggs on the side of the tube under the soil. The eggs were cylindrical and slightly oval in shape, and of a darkish-amber colour. They were so small that it was almost impossible to discern them with the naked eye in the free soil, but as most of them were laid on the side of the tube, they adhered to the glass, and it was possible to detect them easily. On 1st December two young larvæ could be seen crawling about the tube. They were small, white, hairy, legless grubs about 1 mm. in length. Although void of legs they could move along freely by means of their mouths and muscular contractions, aided by a sucker-like anal appendage. After they had grown a little I compared them with a full-fed larva which I had found at the same place in September, 1919, and which I thought at that time was a dicky rice. This had a row of reddish bristles, forming a round crown, on the dorsal surface of the anal segment, which proved a very marked characteristic. When very small I could not notice this on the larvæ hatched from the eggs, but as they grew it became apparent, under the microscope, that some of the hairs were turned backward on that particular segment.

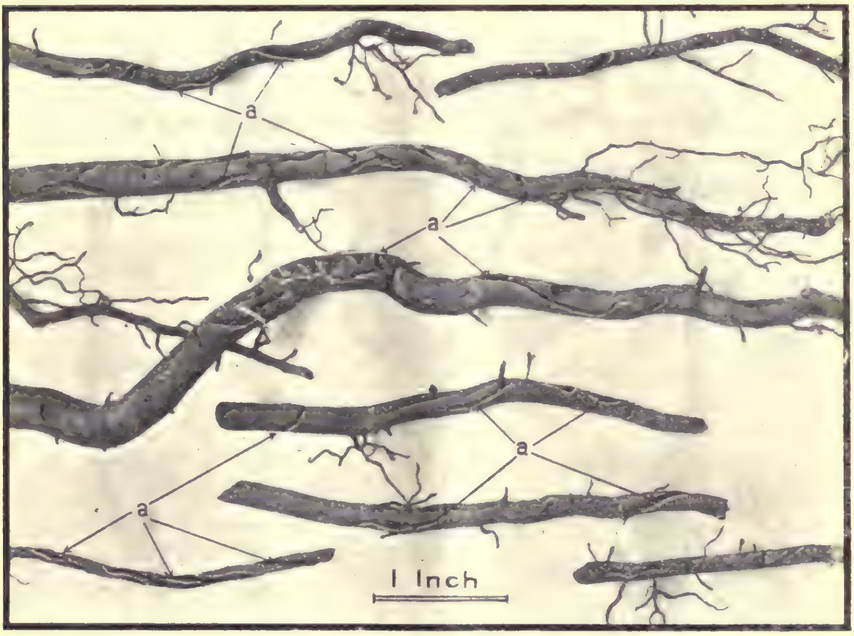
On 9th December I collected over 100 adult weevils off some young trees; they were at that time eating the leaves vigorously and pairing freely. These yielded another lot of eggs from which more larvæ were bred.

On 14th December I took more larvæ out of the original tube. These were larger, and the hairy crown on the anal segment referred to above could be more easily observed.

On 2nd January, 1920, I decided to try the soil again for larvæ and to go deeper for them. I dug up some stocks, and then dug down immediately

under where I had taken them from. At about 9 inches deep I found one pupa, and from that to a foot deep, I got ten pupæ and eight larvæ. These larvæ were full-fed, and they showed the hairy crown distinctly, like the one procured in September. Some of the pupæ were well developed, and showed the complete form of the adult, but the elytra were soft, and the markings faint. One, however, had matured sufficiently to enable him to walk about freely. I put some of these away and allowed them to develop.

On 27th January another search resulted in six more larvæ being secured, and four more pupæ. One of these pupæ could move its legs about freely. Although some of these pupæ had now assumed the adult form and were able



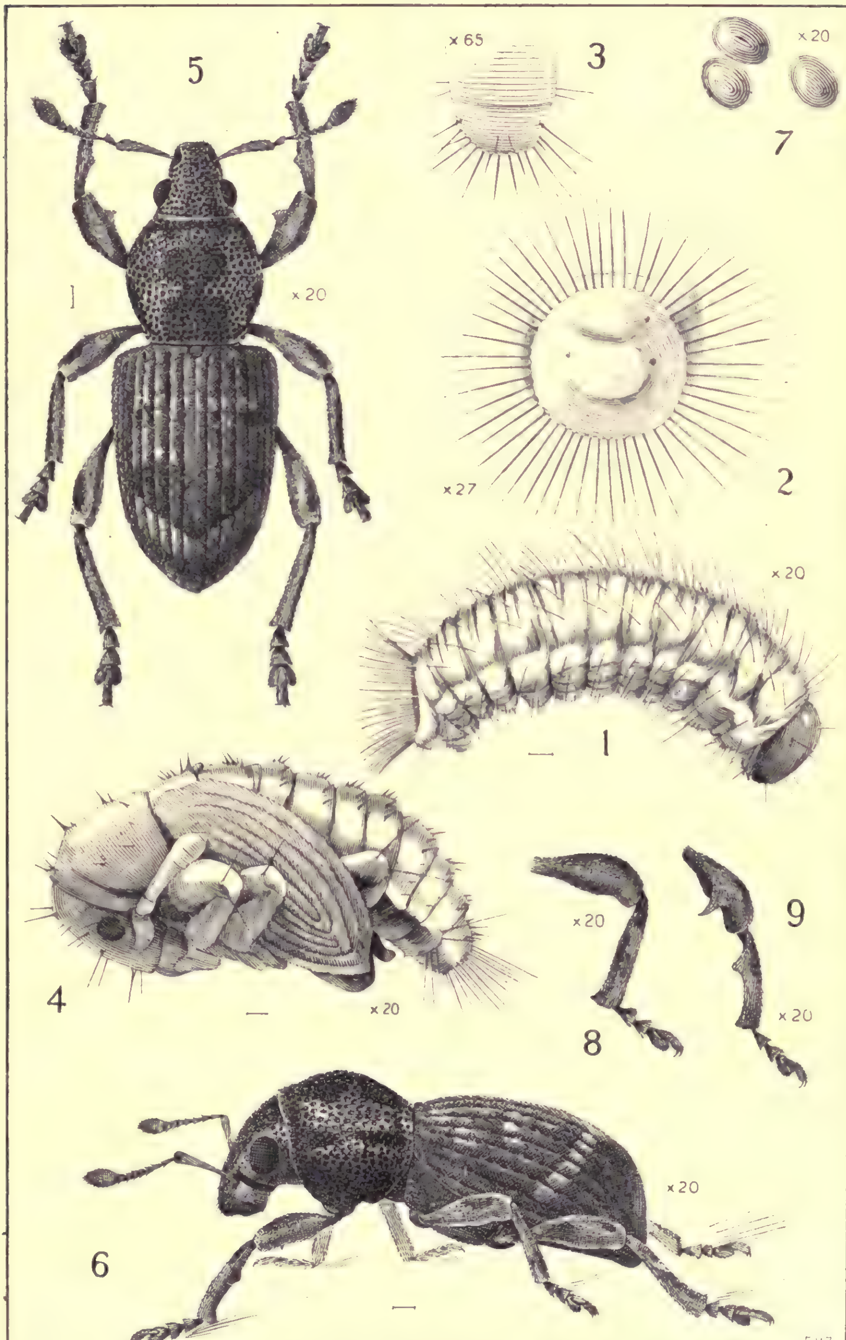

**Roots of young Apple Trees damaged by Dicky Rice** (*Prosayleus phytolymus*).

to move about in the soil, their appearance suggested that they would not emerge until the end of February. It appears to be one of the laws of nature that these insects (which live chiefly on young shoots and foliage), should emerge in conjunction with the starting of the two main growths in the year, viz., the spring and the February growth. They attack the young shoots, and in many cases eat the crown right out, and in others so damage the young shoot that its growth is stunted and deformed. The young tender leaves are eaten half away, all round the edges, and the outer surface is chafed in patches almost all over the leaf. The older leaves when attacked, are eaten all round the edges, leaving them irregular and scalloped. The young fruit is also attacked, and the outer surface nibbled off in irregular patches and

lines. These develop into brown, rusty looking disfigurements that sometimes make the fruit almost unsaleable, though it is not damaged at all internally. Young trees which have been eaten badly never make much

**Foliage of Apple Tree damaged by Dicky Rice** (*Prosayleus phytolymus*).

growth, and will often stand in the nursery for two years without making more than a foot of young wood. This used to puzzle us at one time, but now that we know that the larvæ are damaging the roots we are better able to




**Life History of the Dicky Rice Weevil** (*Prosayleus phytolymus*).

1. Larva of weevil. 2. Spined process on tip of abdomen of larva. 3. Tip of abdomen. 4. Pupa. 5. Dorsal view of perfect beetle. 6. Side view of same. 7. Eggs. 8 and 9. Fore-legs of male and female beetles.

understand it. After washing the roots of the plants I dug up I could notice the chafing on the bark, and in many cases could follow the distinct corrugations along the roots caused by the nibbling of the well-developed larvæ. In this respect these larvæ are almost identical with the apple root borer, but as they are so small it is much more difficult to detect their work.

There are evidently two broods in the year, and the months in which emergence chiefly takes place seem to be October and November for the first, and February and March for the second. These dates may vary a little according to the season, but anyone wishing to operate should watch for the very first appearance of the adults, and then start immediately.

Mr. Spurway, to whom we are greatly indebted for his hearty co-operation by permission to dig up young plants where necessary, has adopted a very good plan to keep his young stuff free from this pest. He has secured a large area of land, which enables him to keep on shifting his beds as the weevils appear in any quantity, and at present he has one of the finest plots of young citrus trees I have seen for a good while, almost free from any trace of dicky rice. Now that we have located the habitat and have learned more about the habits of the larvæ I have recommended that he surround the discarded beds with low wire-netting, and place two or three clutches of chickens in each during the emerging periods, leaving a few low plants in each area to attract the weevils. Where there is other nursery work going on close by it will be necessary to enclose the hens in coops, and the coops should then be placed close to some of the young plants, to enable the mothers to teach the chicks to scratch for the pupæ, as well as to eat the adult weevils when they emerge.

During my investigation I visited two citrus orchards in a district that used to be very badly infected a few years ago. I examined the trees but could only find a few isolated specimens. In both cases I noticed these plots had been enclosed and used as poultry runs, and then it occurred to me that, perhaps, the fowls had learned more about the habits of the dicky rice than we had, and that they had made good use of their knowledge.

Some nurserymen claim to have made good kills with arsenate of lead sprays. I know many who claim that it is not at all satisfactory, but I feel confident that if done judiciously it would prove a good remedy.

Although the pest is a serious one and can be found in almost any part of Cumberland, it is not nearly so bad here as it was fifteen years ago. Possibly this may be due to the fact that other predaceous insects have been operating freely on the weevil. In searching for the larvæ, I found quite a number of small carab beetles and Therevid fly larvæ, which are both very carnivorous. This will provide material for further study, as will other modes of treatment that may suggest themselves, now we know more about the life history and habits of the weevil.

# The Sterilization of Tobacco Seed-beds by Steam.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist, and
C. J. TREGENNA, Tobacco Expert.

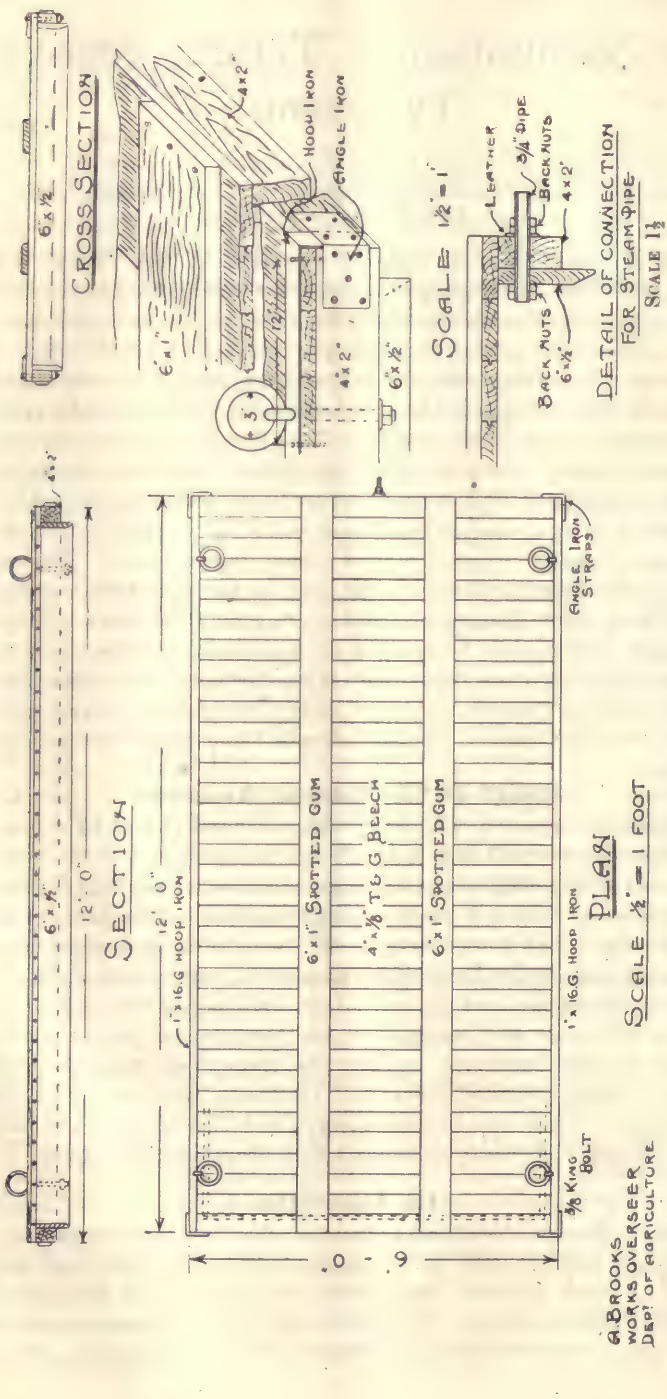
THE most dreaded disease in tobacco seed-beds in New South Wales is "blue mould" due to the fungus *Peronospora hyoscyami*. It usually makes its first appearance when the seedlings have five or six leaves, blotching these with irregular yellow patches or giving the whole leaf a pale shade of the same colour. On turning over the leaf and examining the under side, the region of the discoloration is found to be covered with a fluff of a pale violet tinge—hence the name "blue mould." This fluff, when examined under the microscope, is found to consist of vast numbers of branched fungus threads, each branch bearing at its extremity a pale lemon-shaped spore. The spores are produced in countless millions and serve to spread the disease with extraordinary rapidity when once it has made its appearance. The complete life history of the fungus is not known; but on account of the success which is claimed from the treatment of seed-beds in general by the use of steam, it was thought worth while to give the method a trial on tobacco seed-beds—more particularly as it has been tried for similar purposes in America. The apparatus used by the writers was made to a specification drawn up by Mr. A. Brooks, Works Overseer, its main details being taken from an American publication.

### Design of the Steaming Apparatus.

The apparatus consisted of a heavy frame of wood 12 feet by 6 feet. The outer framework was of 4 inch x 2 inch spotted gum and it was covered on one side only with $\frac{7}{8}$-inch tongued and grooved beech boards. Nailed to the inside of the frame was a 6 inch x $\frac{1}{2}$ inch blade of spotted gum, bevelled on the lower edge. All joints were made steam-tight, and when earth was banked over this blade the whole apparatus was steam-tight. Fixed through the frame at about 12 inches from each corner were 3 inch x $\frac{3}{8}$ inch ring bolts, with nuts and washers on the lower ends. Stout poles passed into these enabled four men to shift the frame from place to place when necessary. In the centre of one end of the frame, fixed with back-nuts and gaskets, was a $\frac{3}{4}$-inch steam connection about 7 inches long and projecting on the outer end sufficiently to connect with the steam hose union.

### Its Application.

To make effective use of this apparatus one requires an engine capable of maintaining a pressure of 70 lb. per square inch; such engines are possessed by many tobacco growers, being used for purposes of irrigation. The remaining requirements are a cock for regulating the steam, several lengths of steam pipe, and about 25 feet of steam hose $\frac{3}{4}$-inch diameter. The piping




Details of a Pan or Frame used for steaming Soil.

having been connected to the engine and the frame placed over the seed-bed, the steam is turned on and allowed to pass into the frame for half an hour. The frame is then lifted to another portion of the seed-bed and placed so that one edge overlaps the portion of the ground previously treated, and the operation of steaming is repeated. As the frame is shifted to each new patch the portion from which it has been removed is covered with hessian so that it may retain its heat as long as possible, and the whole operation is repeated until a sufficient area for the purposes of the grower has been dealt with.

In our experiments it was found that after about a quarter of an hour the frame began to lift slightly and there was a tendency for some of the steam to escape at the sides. This was easily overcome by putting two heavy logs on the top of the frame and shovelling earth around the edges so as to bank them up. The heat given out by the steam penetrates very deeply into the earth, and by use of the hessian the heat is retained for a considerable time. In one experiment, before commencing, three potatoes were placed 3 inches, 4 inches, and 6 inches below the surface of the ground. When the frame was removed after half-an-hour's steaming, the two potatoes nearest the surface were completely cooked, and the deeper one nearly so. It is hardly likely that any fungus spores would survive a temperature capable of producing this result.

### Effect of the Treatment.

The beds were sown a few days after the steaming operation had been completed; the subsequent growth of the seedlings was good. The outstanding feature of the treated beds was their absolute freedom from every kind of weed. The very tedious operation of weeding tobacco seed-beds—one which must be performed over and over again—is thus entirely eliminated. On the major portion of the treated beds the plants were strong and healthy; on one small spot, however, the seedlings failed to grow. The reason for this is not obvious, but we hazard the conjecture that it was due to want of sufficient water, for it has been found that steamed soil requires a larger amount of water than unsteamed.

It is reasonable to suppose that soil steamed as described is sterile, but plants grown upon it enjoy no immunity if an infectious disease breaks out in their vicinity. As a matter of fact, "blue mould" did break out in some tobacco seed-beds not far removed from the treated beds, and a few days afterwards the plants here also became affected. As already pointed out, the spores of "blue mould" are produced in countless millions and are likely, therefore, to be carried from one place to another by the wind or by workmen, on their person or on their implements.

### Conclusions.

In agriculture it is not permissible to draw definite conclusions from one season's results, but our inferences from this year's experiment are as follows:—

1. Steam sterilization may easily be practised by those who have the necessary power to maintain steam at a pressure of 70 lb. per square inch.

2. The treated beds are entirely free from weeds, and presumably from fungus spores.
3. The operation is a lengthy one, but the subsequent freedom from weeds is a consideration.
4. No absolute immunity from "blue mould" can be expected unless the whole of the seed-beds and those on adjacent lands are treated, and unless workmen from infected areas are prevented from visiting the beds.

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## "LEADED BORDEAUX" SPRAY: AN ANALYSIS.

AN analysis of Leaded Bordeaux shows the following composition:—

| | Per cent. |
|---|---|
| Lead oxide ... ... ... ... ... ... .. ... | 38·47 |
| Arsenic acid ... ... ... ... ... ... ... ... | 15·95 |
| Lime ... ... ... ... .. ... ... ... ... | 17·31 |
| Copper (4·32), expressed as crystallised copper sulphate ... | 16·96 |
| Carbonic acid ... ... ... ... ... ... ... | 2·05 |
| Oxides of iron and aluminium ... ... ... ... ... | 1·26 |
| Not determined ... ... ... ... .. ... ... | 8·00 |
| | 100·00 |

The lead arsenate present probably exists in combination as 30·67 triplumbic arsenate with 24·37 diplumbic arsenate; or, expressed in another way, 55·72 per cent. of the lead arsenate present exists as triplumbic arsenate and 44·28 per cent. as diplumbic arsenate. The preparation therefore consists essentially of 55 per cent. of lead arsenate, 16·96 per cent. crystallised copper sulphate, and 14·7 per cent. of lime, excluding what is present as carbonate and useless for the preparation of Bordeaux mixture.

According to the formula for preparing Bordeaux mixture recommended by this Department in Farmers' Bulletin No. 72, page 31, namely, 6 lb. bluestone with 4 lb. lime, the above amount of bluestone (16·96) should require 11·3 lb. lime, whereas 14·7 is present. This slight excess of lime may possibly be introduced to compensate for any change in the lime from oxide or hydroxide to carbonate.

According to instructions issued with the preparation, 2, 3 or 4 lb. should be used to each 50 gallons of water; 32·7 oz. of Leaded Bordeaux would contain 18 oz. of lead arsenate (which is the strength for lead arsenate spraying recommended by the Department). This amount (32·7 oz.) of the preparation would at the same time contain 5·55 oz. bluestone, the equivalent of which would be contained in 50 gallons spray. The Departmental Bordeaux mixture, 6–4–50, would contain the equivalent of 96 oz. bluestone per 50 gallons, so that the Bordeaux produced by the preparation under notice would be in this case about 17 times too weak.

If 4 lb. Leaded Bordeaux be used per 50 gallons, the strength of the lead arsenate would be twice that recommended by this Department, and the strength of the Bordeaux would be about $8\frac{1}{2}$ times too weak.—A. A. RAMSAY, Principal Assistant Chemist.

# The Rice Bean (*Phaseolus calcaratus*) or so-called **Jerusalem Pea** (*P. trinervis*).

A. H. HAYWOOD, Manager, Wollongbar Experiment Farm.

ATTENTION was directed to the Jerusalem pea by the work of W. Fawcett on "The Banana, its Cultivation and Distribution," in which its use as a green mulch in banana plantations was strongly recommended.

In 1916 I obtained, through the courtesy of Mr. Edwin Cheel, of the Botanic Gardens, Sydney, a dozen seeds of the rice bean (which is identical with the

**The Rice Bean (*Phaseolus calcaratus*) in a Banana Plantation.**
The density of the growth is worth noting.

Jerusalem pea) and planted them at Wollongbar Experiment Farm in December of that year. The first crop of seed from these was destroyed by field mice, but a second crop was produced the following November, and this provided seed enough for further trials and distribution.

A Richmond River banana grower to whom seed was sent, reported on it as follows:—

"I planted the rice bean seed in rows, between bananas, in virgin, rocky ground, at the same time as the suckers last January. The vines quickly

covered the space between the rows, and grew to a height of 2 feet. The crop produced a large quantity of seed by April, and was again flowering in December. Where the beans were sown no chipping whatever was required from the time of planting, whereas the chipping of weeds on the other untreated portions of the plantation cost £5 per acre."

Whilst this legume chokes down objectionable weed growth, its presence means the constant enrichment of the soil by the accumulation of nitrogen and by the formation of humus. The only obvious objection to this green mulch system lies in the fact that the banana plants are to some extent robbed of moisture. The loss, however, is not as great as it at first appears, as the dense quantity of falling dead leaves completely covers the surface soil, and so conserves moisture. The alternative crop of weeds would take up far more moisture than the legume, would add nothing to the soil, and would cost money to get rid of.

Unlike other legumes generally recommended for green mulching, the rice bean vines are easily kept within bounds, and last longer; hence they serve as a more permanent mulch. On the North Coast, where torrential rains prevail every year, a lot of surface soil may be saved by the use of this valuable legume.

Following is an extract concerning the crop from "The Peas and Beans of Commerce," an article which appeared in the *Bulletin of the Imperial Institute*, Vol. xv, No. 4, October-December, 1917. The characteristics described, it may be remarked, tally exactly with those observed during the crop's growth at Wollongbar, where the seeds produced were maroon in colour when matured :—

The rice bean (*Phaseolus calcaratus* Roxb.) is found wild in India, and is also cultivated throughout the tropical zone from the Himalayas to Ceylon, and to a limited extent in Japan, China, Mauritius, Java, and the Philippines. It may be grown at a higher elevation than most other pulses, being found at an elevation of 6,500 feet in the North-west Province, and of 5,000 feet in the Khasia Hills.

The plant is an erect or sub-erect annual, from 1 foot to 2 feet 6 inches high, with twining branches several feet in length furnished with trifoliate leaves resembling those of the dwarf French bean. The young vegetative parts are clothed with short, fine white hairs that are deciduous. The flowers are yellow, produced in short racemes comprised of from five to twenty flowers; the pods are slender, nearly cylindrical, 3 to 4 inches long, curved, with a pointed tip, and each pod contains from eight to twelve seeds.

According to the variety and state of maturity, the seeds vary in colour from straw-yellow to greenish-yellow, brown, maroon, or black. The prominent white hilum raised above the surface and crinkled at the margin readily distinguishes this species from the other small seeded kinds.

After three years' careful tests and observation, I can strongly endorse the recommendation by Barclay (W. Fawcett) of the rice bean as a green mulch. The recommendation applies particularly to North Coast banana growers who have (or intend to establish) plantations on steep, stony ground. The beans should be sown as soon as the bananas are planted; two rows, 3 feet apart between the rows of bananas, is sufficient. In this way a small quantity of seed (about 4 lb.) will plant an acre.

# Poultry Notes.

## April.

JAMES HADLINGTON, Poultry Expert.

The principal work on the commercial poultry farm for this month will be the getting together of the breeding stock. It is most desirable that this work be completed by the 1st May; therefore, where new stock has to be introduced, no time should be lost in making purchases. The main portion of the work, however, is with the hens and pullets that are to be bred from; the male birds need not be put in the pens quite so early, though it is desirable that they be in the pens by the middle of next month. Of course, it may not be possible in every case to make up all the breeding pens required so early, particularly the second-year-hens portion of the matings. Many of these might be still fairly heavy in the moult, and if they are on a good extensive run and are being kept under better conditions than would obtain in the breeding pens, it might be advisable to leave them till a little later. But it does not follow that because hens have not quite completed their moult they should not be put into the breeding pens to settle down before the time when they are required for breeding from. That is a matter where the discretion of the breeder should be exercised. One of the most fatal mistakes made by poultry breeders is to leave the mating of their breeding birds until too late in the season.

### A Common Error.

One of the errors made by poultry keepers with limited experience is to accept advice whereby they are induced to make an attempt to hatch only heavy breeds at first, say during the months of June and July, and to leave the hatching of light breeds, such as Leghorns, until August and September. This practice is responsible for many thousands of late and unprofitable chickens being hatched. The facts are that while, if a discrimination is to be made, it is, of course, better that way than the reverse, it is far preferable to have some early chickens of both breeds. Unless this is done, the light breeds will very soon deteriorate just by reason of the fact of being continually hatched too late, and the impossibility of securing well-matured stock to breed from the following year. Thus the effects of late hatchings are cumulative, to the detriment of the breed.

Then again, there are but comparatively few poultry keepers who can ensure sufficient eggs of one breed (if they keep two breeds) to enable them to keep their incubators full so early in the season. This will be better understood when it is stated that the highest average egg-laying made in one year in the competitions at Hawkesbury Agricultural College was seventeen eggs per pullet for the month of June for first-year hens, and six eggs per hen for the same month in the case of second-year hens; seeing that these are all selected hens representing the best that their owners could bring up, it is not likely that the average farm pullet or hen will come up to this record, although, as

in the competitions, individual pens will, of course, put up higher tallies. Probably the June average for birds penned for breeding purposes would be nearer eight and three respectively. However, the fact remains that the average poultry farmer finds it difficult to secure sufficient eggs from his breeding pens in June to enable him to set all that are desirable, and he has generally to be content with what he can get. This is all the more reason why he should set all the suitable eggs available, whether from heavy or light breeds, because whatever may be said against early hatching of light breeds one thing is certain, as many are now being brought to realise, namely—early hatching is preferable to late hatching in any breed.

**Another Mistake.**

Another error that is creeping into the poultry industry is the idea of attempting to hatch all the chickens in the space of a month or six weeks. Such notions have followed the introduction of mammoth incubators and certain classes of brooders, and while mammoth machines have their legitimate place in the industry, in the case of the smaller farmer big facilities for hatching often prove his undoing. It appears tempting to the beginner, and, I fear, to many others whose experience should have taught them differently, to hatch out practically all the chickens in one or two lots in what they consider the best month, put them through, and have done with the rearing season, instead of spreading it over double the time. The great drawbacks to this idea are, firstly, that to secure efficient working it involves a great expenditure on brooder equipment, which is the most expensive item in equipping a poultry farm; and, secondly, that the attendant himself, as well as well as the equipment, is usually unable to cope with the number of chickens to be handled in so limited a time. Nor does the trouble stop here. The whole rearing equipment for the later stages becomes congested, too many growing stock have to be put together, with the attendant consequences—poor development, sickness and often enormous losses, followed, finally, by the breakdown of the farm.

On the other hand, if the hatching is started as soon as eggs are obtainable in June, the eggs being set as they become available, and one incubator after another filled in consecutive order until the whole capacity is occupied, the chickens will, of course, be hatching in the same order, be easier to handle, and can be given better conditions during the six weeks in the brooders and right through all the rearing stages than would be possible if too large a number were brought out at once.

A poultry farmer desiring to rear 1,000 chickens between the 1st June and the middle of September should be able to obtain these by the use of two 120 to 140-eggs and one 240 or 360-eggs capacity incubators, and eight brooder units of 100-chicks capacity (day olds), thinning the number in each brooder down first to seventy-five, and then to fifty, as they progress in age and size, as previously advocated in these notes. On the other hand, if a large number of eggs are to be put down at one time it usually means waiting until well on in July before they become available, and if good hatches are secured the number of brooder units mentioned is inadequate to allow of thinning

out after the first three weeks. The plan advocated here allows of the first batches of chickens being pushed forward out of the way of the progressive hatchings, and a smaller brooder capacity can handle them with more facility than would be the case where too many were hatched at one time, even were eggs available—and they generally are not until some of the most valuable weeks are lost. This advice will probably be regarded as "out-of-date" by people perhaps not wholly disinterested, but the tragedy of failure, and the abnormal wastage of chicken life that took place during the past rearing season (the result of "get chickens-quick" methods) is cause for sounding a note of warning. If the loss of chickens was the only result the case would be less serious, but, unfortunately, it is not. The conditions that cause such great mortality result also in loss of physique and stamina in the survivors.

The moral is that poultry farmers should aim at rearing only the number of chickens that can be safely put through their equipment, and should extend the hatching over a sufficient length of time (within the season, of course) to enable them to rear thrifty stock, which alone will pay, particularly in these times of high cost of feeding.

This is the season of the year when all these considerations should come into focus, and when complete plans can be made that may prevent much of the loss referred to above.

## Some Causes of Premature Staleness in Eggs.

Exeracts from a correspondent's letter, with the opinion expressed by the Poultry Expert on the issue raised:—

"My surplus of eggs is sold every Saturday to a grocer. No egg is more than seven days old when it reaches him, yet he complains that some of them are bad. . . . The nests are on the ground and in wet weather the eggs are very often muddy when gathered, and have to be soaked in cold water and the mud rubbed off when it is soft enough. . . . The eggs are placed each night in a butter box with a lid on—without packing, just piled on top of one another. While waiting to be sold at the grocer's they are kept in an open butter box under the counter."

"Eggs kept for seven days after being washed would be most likely to go bad—they would certainly be stale. Again, when eggs are being washed, especially if large numbers are put into a quantity of water, many are likely to become fractured, and would deteriorate rapidly. Washing removes the natural protection from the egg and gives access to bacteria. Soiled eggs are better left unwashed until the day on which they are to be packed; in the meantime they should be kept quite dry.

"Concerning the method of storing mentioned, it must be pointed out that if the butter boxes used were in the slightest degree tainted the odour would be conveyed to the eggs. Seven days is rather a long time to keep eggs before marketing—particularly in summer time. It is conceivable that the grocer to whom those in question were sold might have kept them another week exposed to the air and perhaps draughts. In such event they would certainly not be fresh."

C

# Orchard Notes.

## April.

W. J. ALLEN and W. le GAY BRERETON.

### Harvesting.

In the tableland districts the harvesting of late apples and pears will still be in progress. Often when the market is not good, these are not rushed away, but kept either in ordinary or cool storage. Those intending to operate in this way should keep in mind that care in picking and the subsequent handling of fruit are big factors in its keeping qualities, and, as has been pointed out more than once of late in these notes, the fruit should only be picked while it is cool and then kept as cool as possible. The stems should not be broken out of the fruit when picking, for when this is done the flesh of the fruit is exposed, and decay is likely to set in earlier than if the stalk is kept intact.

If for any reason picking during the warmer part of the day is unavoidable, the fruit should be exposed to the cool air of the night before being cased up.

### Green Manuring and Cultivation.

In districts where the rainfall is usually sufficient to permit this practice, crops for ploughing under later can still be sown this month, but as a rule it is better to get them in earlier. In districts where the rainfall is limited, it is a good practice to plough early in the autumn so that all the rain that falls between the time of ploughing and the spring is stored for the trees for the following season.

### Planting.

In the coastal districts where the autumn is mild and frost is not likely to occur, planting of citrus trees can be continued this month, provided the soil is in moist enough condition. Care should be taken that the roots are not exposed and allowed to dry during transplanting from nursery to orchard. If dry weather sets in after planting it may be necessary to water newly-planted trees. Orders should now be lodged with nurserymen for deciduous trees required for planting this winter. If anything has hitherto prevented the ploughing and subsoiling of land intended for planting this season, it should be done as soon as possible. The advantage of having this done some months before planting is that any rains that fall during the interval are absorbed and retained for the trees, and one can make more certain of the soil being in right condition for planting when that season arrives. Moreover, the soil is sweetened, and stiff soils are more effectively and cheaply brought into crumbly condition by the weather than can be done by any implement. Where any refills are to be made in the orchard, a large hole should be excavated where the tree is to stand and filled with fresh soil; this gives the new tree a better chance to make fair headway. If manure is also used, it should be well mixed with the soil. It must be remembered

that a "refill" amongst old established trees has an unequal chance against the older trees, and it therefore requires special attention at planting and for several seasons afterwards, to enable it to make satisfactory headway.

### Liming and Manuring.

The autumn is a good time to carry out liming. If quicklime is used it should be distributed in heaps over the land and covered with soil. When the lime is slaked it should be spread evenly over the surface and cultivated in. If crushed quicklime is used, it can be spread direct and cultivated in. A bulletin on liming, which deals fully with this subject and explains the action of various forms of lime, can be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney. Growers would be wise to study this publication before purchasing any form of lime.

This is also a good time, provided the soil is not too wet, to cart out and spread amongst the trees any farmyard manure that has accumulated; this will then be ploughed under in the regular ploughing of the orchard. These remarks also apply to the application of fresh soil or bush scrapings.

### Citrus Scale.

Provided the trees are in strong enough condition it is not too late to fumigate to rid them of red, brown olive, or wax scale or of white lice. In fact one of the advantages fumigation has over spraying is that it can be left until the eggs have completed hatching, without danger of those that have hatched earlier becoming too old to kill.

## Energy and its Relation to the Life of Bees.

The answer to the question "What is the average life of the worker bee?" is of great importance to the apiarist, for when the conditions that govern the period of existence are understood something might be done toward making it (at a desired time) considerably longer. The length of life of the worker bees is governed by the energy they put into their work. For instance, during a honey flow, when the condition of the colony is normal, with young bees hatching freely, the bees put so much energy into their work that they become quite aged and usually succumb in six or seven weeks. Again, if any abnormal condition (such as the loss of the queen) takes place, then to some extent the bees will reserve their energy so that their lengthened life will give the colony a chance to recover. The period at which this conservation of energy is most desirable is during the winter, and it is at this season that the apiarist himself may help. If wintered in a good hive with ample stores under favourable conditions, the young bees of a populous colony will come into spring with comparatively undiminished energy, so great is their power at this period of conserving their vitality. The case of a colony in a low-class hive, which has excessive space or insufficient stores, or which allows a draught through the cluster, is very different; the draughty state of the hive necessitates considerable activity on the part of the bees in order that the temperature may be maintained, and the extra energy proportionally shortens their lives. Insufficient stores, on the other hand, cause the bees to economise and so to lower their vitality.—W. A. Goodacre, Senior Apiary Inspector.

# Agricultural Bureau of New South Wales.

### Its Usefulness to Primary Producers.

THE war, the influenza and the drought have greatly reduced the activity of the Bureau throughout the State. But the war is over, repatriation is practically completed, and the prospects of more prosperous days appear. Old conditions no longer prevail—perhaps never will—and a vigorous programme of putting more men on the land, and of inviting agricultural immigration is in full swing.

While awaiting repatriation many young farmers have had invaluable insight into the principles of co-operative buying and selling, the management of stud farms, and the working of intensive cultivation areas.

On the other hand, many of the men who are obeying the advice "Go on the land, young man," have done so without experience of actual farming.

The problem of to-day is greater production, and the development of the means of primary production is the aim of this Department, and the definite object of every one of its officers.

The Department is anxious to provide a much more vigorous and extensive organisation of the Bureau than in the past, with a view to bringing these increasing interests together. No locality should be without its branch in days like these.

Branches of the Bureau should aim at—

1. Increasing the number of Farmers' Experiment Plots.
2. Encouraging community spirit and enterprise, with a view to the development of rural industries.
3. Promoting a feeling of confidence and co-operation between the Department and producers, so that correct data of all branches of production may be quickly gathered and as quickly disseminated.
4. Becoming centres of agricultural intelligence at which old hands may freely and quickly learn the methods and appliances that the returned men have seen successfully used elsewhere, and at which new settlers may expect to profit by the experience of older farmers in the district.
5. Establishing systems of co-operation that will allow of wholesale buying of raw materials, reduction of freights and commissions, the establishment of control grades, standards for packing, &c., and that will also control distribution, supply, capital and labour, and generally simplify the supply of the farmer's innumerable requirements.

To assist the development of the Bureau, the Department has appointed Mr. C. C. Crane, B.A., to the position of Organising Inspector of the Bureau. Mr. Crane made a special study of agricultural organisation and development in Great Britain under the auspices of the A.I.F. Educational Service.

## Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

*What quantity of seed is sown for wheat, oats and barley in your district? What differences do you make in quantity of seed as between one variety and another, and as between early and late sowings? Under your special conditions, do you find it advisable to give a heavy sowing or a light one, remembering, of course, that a heavy sowing in one district is a different matter from a heavy sowing in another district?*

*Do you practise selection of seed maize in the field? If so, what characters do you select for, and what advantages have you observed attend the practice?*

*Have you tried ploughing the orchard immediately after the removal of the fruit? The ground is hard and breaks up lumpy, but some growers have found that it retains the winter rains better and that the extra cost for ploughshares is fully covered by the extra moisture conserved. Do you think this would apply under your conditions?*

*Have you tried fumigating citrus as against spraying for scale insects? If so, which did you find the more effective and the cheaper?*

*Which do you prefer—to run the herd bull with the cows or to paddock him separately? If the bull is run with the cows, how do you regulate the flow of milk to the season? It is generally considered that the spread of disease is limited by paddocking the bull; have you had any experience that supports that view?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.*

### Bimbaya.

At a meeting held on 23rd February, the subject set down for discussion was "The work of the Bureau and how best to extend its sphere of usefulness." The subject was keenly discussed, the majority of members taking part.

Members were generally agreed that the branch had done much good work and had fully justified its existence. The Lending Library was a splendid thing, and the majority of the members made use of it as a means of extending their knowledge. By bringing road requirements, &c., under the notice of the shire councils much useful work was being done. Besides forwarding weed and insect pests to the Department for identification, the branch attended to the acclimatisation of fish in local streams, and did all in its power otherwise to assist its members. One speaker stated that the knowledge he had gained from the Bureau in connection with the remedies for the cure of scours, &c., in calves satisfied him as to the value of the institution, and every farmer in the district should be an active member.

It was thought that if the branch could impress upon its members the necessity for regular attendance at meetings, much more good work might

be done. Each individual member could assist in some way, and if all did so the Bureau would eventually become an institution of which its members might be proud.

The subject chosen for discussion at next meeting is "Should the average number of live stock on the farm be increased or decreased, and why?"

### Coraki.

A well attended meeting of this branch was held on 21st January. The principal matter under discussion was the preparation of the exhibit for the annual show which is to be held in May. It is anticipated that the exhibit will be a record one. Great enthusiasm was shown by members to this end.

### Cordeaux-Goondarin.

A meeting of this branch was held on 29th January, when ten members were present.

After the general business of the evening had been dealt with, the apple trophy at Wollongong show and the question of sugar supplies for jam making were discussed.

The usual monthly meeting of the members was held on 26th February. The attendance numbered eighteen.

The branch staged the usual apple trophy at the Wollongong show early in March; the exhibit received much favourable comment. The trophy is on the same principle as that at the Sydney Royal Show, consisting of about thirty cases, and comprising some twenty-five varieties. Some twenty growers contributed fruit. The fruit was afterwards disposed of at good prices.

### Cotta Walla.

This branch held the usual monthly meeting on 2nd February; eleven members were present.

Mr. T. J. Kennedy read a very helpful paper entitled "How to fill in your State Income Tax Return." Preliminary arrangements were made for staging the non-competitive exhibits at local shows.

### Dural.

Considerable activity is being shown by this branch. At the last meeting held on 20th February, twelve new members were enrolled.

A discussion took place on the questions asked in the February issue of the *Gazette*, and it was agreed that early sowing is preferable, especially for Grey field peas, which are planted as early as February, and that Grey field peas give the biggest yield of greenstuff if sown early.

### Glenorie.

A meeting of this branch was held on 31st January, when nine new members were enrolled.

The Vice-chairman, Mr. E. King, gave a report on the motor trip to the Hawkesbury Agricultural College. Twenty-eight of the members, together with their wives, visited the College, and after lunch visited the orchard in company with Principal H. W. Potts, who explained the different varieties of fruit trees and their growth. The party then divided into two sections. One half—the members interested in poultry—were taken in charge by Mr. Lawrence, who showed them the competition pens, College stock, incubation and brooding houses, and gave them a good idea of the way

young stock were handled, and any other information required. The feed room was also visited and feeding and mixing processes discussed. The remainder of the party, under the guidance of the Principal, visited the piggeries, and finally the cattle sections, where a good view of the cattle and of milking by machines was afforded. Afternoon tea marked the conclusion of a very interesting and instructive day. A vote of thanks was accorded the Principal and Mr. Lawrence.

### Kellyville.

A meeting was held on 6th March when four new members were elected. It was stated that the branch won the first prize, £3 3s., at the Castle Hill show. The exhibit was afterwards sold at auction and realised £8 8s. 6d., which sum was donated to the Parramatta District Hospital.

### Inverell.

The annual meeting of the branch was held on 5th March, Mr. C. Lenthal presiding. The secretary's report showed that the year had been one of useful activity, valuable lectures, papers, and demonstrations having been given. The balance-sheet disclosed a debit of £1 7s. 9d., which would be covered when the subsidy was paid. The election of officers resulted thus:—Chairman, Mr. C. Ditzell; Vice-chairmen, Messrs. C. Lenthal and W. R. Fry; Hon. Secretary and Treasurer, Mr. W. Kook; Auditor, Mr. T. Knapton.

### Lidcombe.

At the monthly meeting held on 9th February, Mr. Finch gave a short lecture on the arrangement and judging of flowers, explaining the different points taken into consideration by the judge. There was a good display of flowers for the monthly competition, and by using them for illustration Mr. Finch was able to point out many mistakes which, once corrected, are rarely repeated. A hearty vote of thanks was passed by acclamation.

### Lower Portland.

At the meeting of members on 3rd February, a paper on pruning was read by Mr. G. M. Blundell. The paper was much appreciated by those present as setting forth practical experience, and it provoked a useful discussion.

### March.

A meeting of this branch was held on 16th February.

During the evening a paper on simple tests for soils and also dealing with necessary plant foods was read by the secretary, Mr. R. Parker. The following extracts are taken from it.

#### Necessary Plant Foods.

There are thirteen essential elements of plant food, and, of these, three—nitrogen, phosphorus and potash—are often deficient. Water supplies oxygen and hydrogen, while carbon comes from the air.

Nitrogen is the most important element, and this the farmer can add to his soil by supplying humus. It comprises part of all green and woody parts of plants. If insufficient nitrogen is present, provided the water is sufficient, plants tend to be dwarfed and to lack vitality, while too much nitrogen (the water content being the same) is shown by excessive growth—note any old sheep camps. Hence all crops that are produced for their leaves—as cabbage, lettuce, spinach, rape, &c.—require a lot of nitrogen, but in the case of turnips, beans, peas and other legumes, too much nitrogen produces leaves and stalks at the expense of roots or fruits.

Humus adds nitrogen to the soil. Humus is insoluble, but in the soil it is acted upon y certain bacteria, which make it available as a plant food.

The air consists of about four-fifths nitrogen, but this is not available to most plants. Certain of them, legumes (beans, peas, clover, &c.) have the power of drawing the nitrogen from the air, and storing it in root nodules—hence the value of leguminous crops. The crops can be fed off, and then ploughed in, the ground being enriched both by the manure and by the nitrogen on these nodules. Nitrogenous manures must not be applied to leguminous crops.

Phosphorus does not occur in nature in the free state, but usually in the form of phosphates. Phosphoric acid is next in importance to nitrogen, and is contained in all soils, though in variable quantities; it forms the stiffening matter in the stalks of plants, such as cereals, and is necessary to produce strength and vigour in young plants. When humus decays it makes phosphoric acid available, hence deficiency in humus means less phosphoric acid. Bones and phosphatic rocks (among the chief sources of phosphoric acid) are not soluble in water, and they are chemically treated to change the various phosphates into superphosphate, sulphide super, and Thomas' phosphate. Other sources of phosphatic manures are guanos, or manures of birds, which are found on the islands in the Pacific and Atlantic Oceans.

Potash is the most important mineral plant food, and is necessary to produce woody tissues and starch. It is specially beneficial to fruit plants, root crops and potatoes. Like phosphoric acid, potash becomes available through the decay of humus. Moreover, farmyard manures contain potash in soluble form, and wood ashes also supply it, though in comparatively small quantities. This is the reason why new lands which have been cleared by burning off respond so well to potatoes, as the potash the tree absorbed from the soil remains in the ashes.

Certain soils (wet and boggy soils, for example) are wanting in certain materials necessary to plant life, being sour or acid. In many cases this is noticeable by the reeds, sedges, &c., that flourish to the exclusion of all else. The usual test for acidity in soils is blue litmus paper. If acid, the litmus turns red. As there are other factors which also act on litmus in the same way, this is not always a reliable test. Even cultivated soils nearly always possess an acid reaction. The remedy in such cases is drainage with the application of lime, say 1 ton per acre, or 8 oz. per square yard. Some growers apply as much as 3 tons per acre.

Departmental Note.—The Chemist points out that the paper does not refer to lime —an important requirement of soils, which has often to be artificially supplied.

## Middle Dural.

At a meeting of this branch on 20th February, the questions asked in the January *Agricultural Gazette* were discussed.

As to the topping of maize, members considered it worth doing; it decidedly improved the size of the cob and grain, and it provided green fodder for stock. The best time to top was just after the flower or tassell had become dry.

For green manuring, barley and green peas were regarded as about the best, the legumes being well sown with the cereal. If sown early they got the winter rains and did not rob the trees of moisture.

The best way to deal with peach tip moth, it was stated, was to pinch off the tips as soon as they wilted, as at that time the grubs would be about half grown and would be easily destroyed, and the tree would shoot again quickly. The tips should not be left until quite dead as the grub would then have escaped. Bandaging had not been tried, as it involved more work.

Departmental Note.—The Chief Inspector remarks that his experience is that the yield of maize is reduced by topping when done early enough to yield tops of good feeding value. If done later so as not to affect the yield, the operation has not been warranted on account of the cost and the smaller amount of fodder of lower feeding value obtained.

The Government Entomologist remarks that if everyone pinched the tips infested with peach tip moth as soon as they showed signs of wilting, it would be all right, but very few do this and when the tips are dead it is too late. Attention to the young shoots with bandaging will certainly much reduce the damage to the peaches the pest do later on.

### Milbrulong.

The monthly meeting was held on 2nd February, when forty-two members attended. The membership fee was raised to 2s. 6d. to provide a fund for the purchase of library books.

At the close of the usual business an interesting lecture was given by Mr. G. C. Sparks, Inspector of Agriculture, his subject being "Dry Farming." The lecture was most instructive and at its close many questions were asked, and answered to the entire satisfaction of all present.

On the following day Mr. Sparks inspected the area of ground provided by Messrs. Lynch Bros. for the purpose of conducting grass plots.

### Springside.

Respecting a parcel of seed wheat of different varieties sent for trial some months ago, the secretary reports that Bomen and Yandilla King proved the best for grain, but as this is not a wheat-growing district in the ordinary sense further trials are not contemplated in this direction. Cleveland is suitable for both hay and grain and is therefore a good all-round wheat for the district. Zealand is the best hay wheat for local conditions, but Major is very unsuitable though an average grain yielder.

The manure tests with 100 lb. and 50 lb. superphosphate per acre showed little difference, the rainfall being insufficient. Both plots, however, showed a better body of hay than there was where no manure was used.

### St. John's Park.

Mr. Laffer, Viticultural Expert, visited this district on 26th February, and gave a budding and grafting demonstration in the afternoon, and a lecture at night, both of which were much appreciated. Arrangements have been made for Mr. C. Pedersen to lecture at St. John's Park on dairying at an early date.

### Tingha.

The usual monthly meeting was held on 6th March, fifteen members being present.

The branch's coming exhibition was discussed. The decision was arrived at not to support the Kellyville branch in protesting against the proposed orchard tax. A programme was arranged for the next six months, several members promising to read papers on various subjects.

### Windsor.

A lantern lecture was delivered to the members of this branch by Mr. H. G. Smith, Apiarist at Hawkesbury Agricultural College, on 10th February. About forty members and visitors were present. The subjects chiefly dealt with were: Modern methods of apiculture, hives and their construction, handling of colonies, swarming, selection of breeding stock, production and marketing of honey and beeswax, and diseases—brood and adult. A keen interest was displayed throughout, and at the close of the lecture a number of questions were asked and methods of introducing queens were discussed at some length.

The annual meeting was held on 5th March, when the report showed that the year had been one of useful work. A cash balance of £12 17s. 5d. was reported. The election of officers resulted thus:—Chairman, Mr. C. W.

Farlow; Vice-chairmen, Messrs. C. A. Jeffreys, G. Davis, J. W. Mitchell and A. C. Hannabus; Hon. Secretary and Treasurer, Mr. W. H. Spinks; Auditors, Messrs. A. J. Berkleman and W. J. Ross.

A number of subjects were discussed, including that of co-operative disposal of produce. In this connection arrangements were made to supply the Kenthurst branch of the National Utility Poultry Breeders' Association with maize, and to divide the profits of the commission agents between producers and consumers.

## Woonona.

The usual monthly meeting of the members of this branch was held on 10th February, a good number of members being present. Six new members were enrolled. The 17th April was fixed for the flower show.

Mr. Eastman read a paper on green manuring, which provoked a lengthy and useful discussion. A summary follows:—

### Green Manuring.

Green manure is very valuable for orchards and for vegetable growing, leguminous crops being the best to enrich the soil. Cowpeas, tares or vetches and beans are about the best for the purpose; these have on their roots nodules or excrescences—white bunchy growths, which are formed and inhabited by colonies of bacteria.

Some people when they pull up a bean or pea and see the white bunches on the roots think they are some disease, but without these nodules the crop would not be a success. These bacteria apparently live on the nitrogen of the air that permeates the soil, converting it into such a form that the plant can absorb it into its system. It is now an undisputed fact that when a plant has plenty of these nodules on its roots it thrives best. It is sometimes found that the nitrogen-gathering bacteria are not present in sufficient quantity to fertilise a crop the first time. Some people say "My garden won't grow peas or beans, but just up the street they grow fine. What is the reason?" Well, in such cases if the first man were to get a load of soil from where legumes thrive and spread it about, he would introduce the nitrogen-gathering bacteria into the soil, and in most cases would not have any trouble in growing peas or beans afterwards. A quaint custom was once in vogue in France. It used to be said that a crop of clover would not grow unless it was blessed by the priest, but to prevent bothering him every time they wanted to sow, they used to get a load of soil from where it had been blessed, and spread it over the field for a blessing. Thus they were practising soil inoculation without knowing it.

Some people think that green manuring is all right for a large farm, but it cannot be of much use in a garden; but that is a mistake, as there are not many gardens that have not got some part of it lying idle for two or three months from now on, and such spots could be planted any time now, as the crops come off, until April. It is not necessary for the legume to mature before turning it in, if the land is required for cropping, although the best results are obtained if it can. The value of these crops is not only in adding nitrogen to the soil; their deep roots bring up phosphoric acid and potash from the subsoil, and then by the decay of the plants a complete plant-food in a most assimilable condition is left ready for the next crop. It is not always advisable to turn in a heavy crop of greenstuff late in the spring in the hot weather, as it is likely to ferment and turn the soil sour, and leave it so badly compacted that capillary action is established in the soil and the moisture dries out quickly, in which case a good dressing of lime would be required to sweeten it.

Rye, rape and barley can also be used for green manure. I have seen good results from barley. I have not found rye much of a success for manuring, as it seems to take nearly as much out of the soil in growing as it puts in. Rape is good for field manuring, but it is not much use for a citrus orchard, as it competes too much with the trees for the moisture. I have had a lot of experience in fruit and vegetable growing, both here and in the Old Country, and I think if there was more green manure used we would have a better quality of fruit and vegetables than we have now.

Departmental Note.—The Chief Inspector commends the clear understanding and expression of this paper. In addition to the plant food provided by green manuring, better tilth and increased moisture-holding capacity are obtained. As regards the actual crop, legumes like field peas and vetches have nearly always given better results than rape, barley or rye.

**Yarramalong.**

Mr. E. Hodges has reported, concerning the potato plots carried out by him, as follows:—

The land was ploughed deep in February, harrowed in February, and again in March, and disc-harrowed at the end of March; ploughed and harrowed in May, harrowed in July, and ploughed again at the end of that month; harrowed in September, planted by ploughing in on 21st September; harrowed 15th October, as the plants were nicely through the ground; cultivated 3rd November, and hilled with cultivator on 21st November. Harvested 15th to 20th January. The yields were as follows:—

| Variety. | Fertiliser. | Yield. | | | |
|---|---|---|---|---|---|
| | | t. | c. | q. | lb. |
| Brownell's Beauty ... | 2 cwt. of P7 to acre ... .. | 6 | 0 | 0 | 0 |
| Manhattan ... ... | 2 ,, ,, ,, ... ... | 3 | 19 | 1 | 24 |
| Eureka .. ... ... | 2 ,, ,, ,, ... ... | 3 | 3 | 0 | 24 |
| Queen of the Valley ... | 2 ,, ,, ,, ... .. | 5 | 1 | 3 | 4 |
| Carman No. 1 ... ... | 2 ,, ,, ,, ... ... | 6 | 3 | 0 | 24 |
| ,, 2 ... ... | Unmanured ... ... ... | 2 | 1 | 0 | 0 |
| Coronation ... ... | 2 cwt. of P7 to acre ... ... | 5 | 3 | 0 | 4 |
| Langworthy ... ... | 2 ,, ,, ,, ... ... | 4 | 1 | 0 | 8 |

In respect to rainfall, which totalled 6½ inches from the time of planting, Mr. Hodges states over 4 inches fell in November in a few days, the result of severe storms, doing a considerable amount more harm than good. The plot throughout was absolutely free from disease, the sample of tubers dug being very good, and considerably better than the previous year. The price realised was £18 per ton.

## A Recipe for Home-made Vinegar.

A recipe which has been found satisfactory for vinegar-making under domestic conditions is as follows:—Crush the grapes, separate the juice from the skins and set the liquid to ferment in a wooden tub or cask. If the grapes are over-ripe it may be necessary to add some water, as acetic or vinegar ferment will not work upon a wine which contains too high a percentage of alcohol. When fermentation is complete, allow to settle for a week or so, in order that the wine may throw down the greater part of its deposit (or lees). Put into the clean cask about a pint of good vinegar with a gallon or so of the wine, shake well and allow to stand in the sun with the bung open except for a protecting piece of cloth, and after a few days add the balance of the wine to about four-fifths of the cask. Protect the bung to prevent flies or other insects entering and allow to stand in the sun or in a room with a temperature of 80 deg. Fahr.

The acetic ferment forms a dull greyish film on the surface of the liquid and this should not be broken. In about two months the alcohol of the wine will be transformed into acetic acid and the result will be vinegar. Allow to stand until clear and then draw off the liquid into either a clean cask or a bottle. In order to hasten clarification the contents of the cask may be put through a filter of closely woven cloth which has been well washed out with washing soda and rinsed in several lots of fresh water. If the vinegar is not quite bright, repeat the filtration; once acetification is complete, it should be kept in a cool place.—H. E. Laffer, Viticultural Expert.

# AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
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| Deniliquin P. and A. Society ... ... ... ... | P. Fagan ... ... | ,, 29 |

## Composition of "Sulpho-arsenate Powder."

An analysis of the preparation known as Sulpho-arsenate Powder shows it to have the following composition:—

| | |
|---|---|
| Moisture at 100 deg. Cent. ... ... ... | 3·07 |
| Lead oxide ... ... ... ... ... | 32·10 |
| Arsenic acid ... ... ... ... ... | 13·66 |
| Sulphur ... ... ... ... ... | 23·83 |
| Lime ... ... ... ... ... ... | 12·25 |
| Insoluble matter ... ... ... ... | 0·32 |
| Not determined ... ... ... ... | 14·77 |
| | 100·00 |

If the lead and arsenic acid found existed as lead arsenate, then we would have 23·46 grams diplumbic arsenate and 22·87 grams triplumbic arsenate present.

The sulpho-arsenate powder appears to consist of 46½ per cent. lead arsenate, 24 per cent. sulphur, diluted with lime compounds (oxide hydrate and carbonate). It will be noted that the preparation is to be used as a dry powder for dusting.—A. A. Ramsay, Principal Assistant Chemist.

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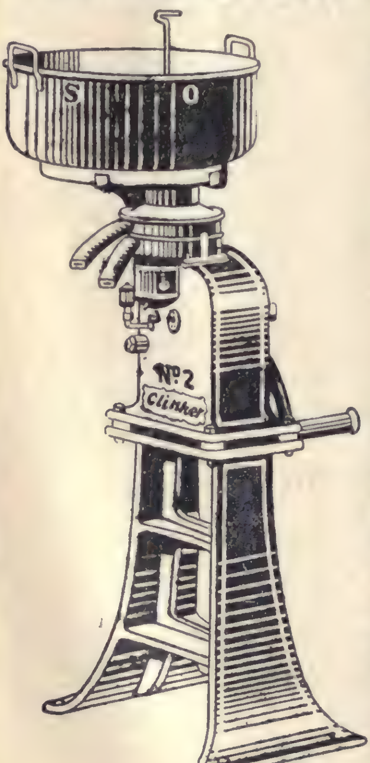


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| ,, | 1 | ,, | 27 | ,, | 14 | 0 | 0 |
| ,, | 2 | ,, | 52 | ,, | 26 | 10 | 0 |
| ,, | 3 | ,, | 82 | ,, | 38 | 0 | 0 |
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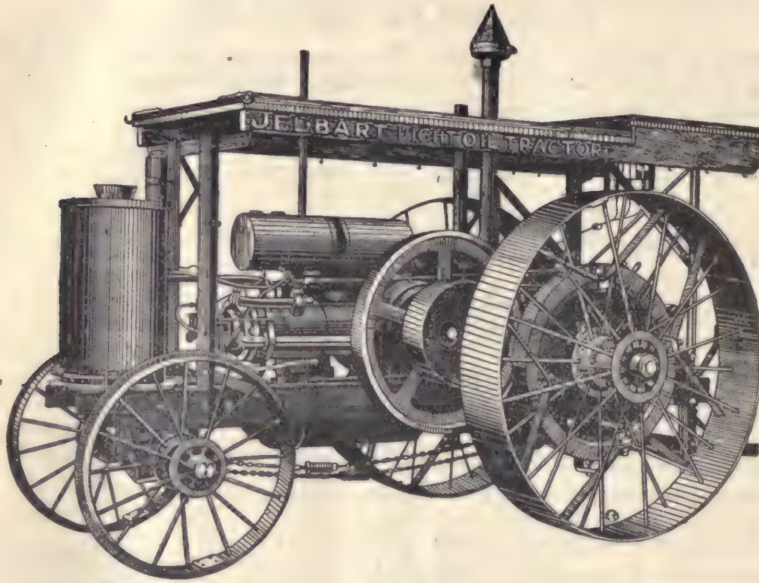


*Agricultural Gazette of New South Wales.*

3°

# Broom Millet Seed as Feed for Stock.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

FROM time to time spasmodic attempts have been made to utilise broom millet seed as a grain food for stock, but beyond a little use being found for it on farms where broom millet is grown for the hurl or fibre for broom-making, no serious attempt has been made to place it on the market as a feed grain until the high prices that have ruled in recent years for maize, wheat, and other grains have drawn attention to it as a neglected asset.

At the present time of grain shortage in New South Wales, it is quoted on the market at £10 or £11 per ton, and with maize at 9s. 6d. and wheat at 8s. 6d. per bushel, it is somewhat in demand, more especially by poultry-farmers. At this price it may be said that broom millet seed, if of good quality, is a comparatively cheap feed, not only for poultry, but for many other kinds of stock (horses, cattle, sheep, and pigs), if fed judiciously.

The factors to be considered in assigning a value to any foodstuff are not only its chemical composition, but its digestibility and palatability, and the ease and cheapness of its preparation, handling, and storage. Judged by the first three factors, there is no doubt that broom millet seed would have a high value, but its most serious drawback is the uncertainty of its safe storage under ordinary conditions.

## Storage of Seed.

The difficulty with the storage of broom millet seed is due chiefly to its being regarded only as a by-product or an asset of secondary importance in the production of the broom millet crop.

This crop is mostly produced on the Hunter River, but also to some extent on other parts of the North Coast, in the Tamworth and Tumut districts, and a little on the western slopes.

At the time of harvesting the seed is never fully mature, although the tendency of late years is to allow the seed to develop fairly well before cutting. Nevertheless, the seed contains considerable moisture however late cutting may be delayed in order to ensure good fibre. After curing in the field, the seed is hackled from the heads, and the usual practice is to store the seed in bulk in the barn as hackling and baling proceed. Not only, then, has the seed still a high moisture content, but at this time of the year (late summer or early autumn) the humidity of the atmosphere is high, and (on the coast at least) the insect pests of grain (weevil and moth) have most ideal conditions for rapid development. The conditions are therefore favourable for great damage by heating and by injury from insect pests, so that without some special care it is not long before the whole mass

becomes useless. Even where weevil is not serious, the mass of grain becomes heated very easily and loses condition because of its high moisture content at the time of storage and the lack of good ventilation, which is necessary in assisting to carry off this surplus moisture quickly.

## Good Ventilation Necessary.

Sorghum or broom millet grain heats more rapidly than any other stored grain, and if special care is not taken to avoid damage from this cause, much loss is occasioned. It does not seem as if, owing to the conditions necessary for dealing with the broom millet crop, any practical method can be evolved which will avoid a high moisture content in the seed when first stored. Some treatment must therefore be given to ensure the quick drying of the stored seed. This is especially to be advised in warm, humid climates, such as the North Coast, where most trouble is experienced.

The following three essentials in the successful storing of broom millet seed will be of interest to broom millet growers and others :—

1. Quick reduction of the moisture content. This is the most important. It may be found to be best accomplished by storing in a loft and using a rough kiln-drying method, after the manner practised on some of the northern rivers of preparing maize for the early market.
2. Thorough ventilation and free circulation of air through the stored grain. This condition may be attained by storage in smaller bulk, by special ventilating devices made with wire fly-screens on the floor of the barn and distributed throughout the heap. Specially constructed small well-ventilated bins to hold 50 or 100 bushels of seed will easily repay their cost in a season or two, with intelligent use of the seed on the farm.
3. The storage of clean and sound grain free from dust and dirt as far as possible. This is attained in practice by clean hackling methods and by taking every advantage of "wind winnowing" during this operation.

## Composition and Feeding Value.

The following table gives the chemical composition of an average sample of broom millet seed with that of maize and corn and cobmeal for comparison :—

| | Water. | Ash. | Protein. | Fibre. | Nitrogen-free extract. | Fat. |
|---|---|---|---|---|---|---|
| Broom millet seed .. | 11·8 | 2·9 | [illegible] | 8·2 | 63·5 | 3·4 |
| Maize... ... ... | 11·5 | 1·4 | 10·5 | 1·8 | 70·4 | 4·6 |
| Corn and cobmeal ... | 10·4 | 1·5 | [illegible] | 7·9 | 67·6 | 4·1 |

It will be seen that although the protein content of broom millet seed is similar to that of maize, the fibre content is about the same as that of corn and cobmeal, while the nitrogen-free extract (or starch) and fat (or oil)

content are somewhat less than either of these. The comparatively high fibre content is due to the adhesion of the glumes or cover to the seed, and the shiny nature of these glumes is responsible for the mistaken notion of a high oil content and wrongful comparison with linseed on this account.

It has been found that the digestibility of the starch is about 10 per cent. or more less than that of maize. With the much higher fibre content, it would seem that broom millet seed has therefore only about 80 per cent. of the feeding value of maize. Being eaten readily, when of good quality, by all kinds of stock and poultry, and therefore of high palatability, a good sample of broom millet seed should be about four-fifths the value of maize. That is, with maize at the present price of £19 per ton, broom millet seed *of good quality* should be worth about £15 per ton. A bushel of broom millet seed will weigh from 43 to 50 lb.

Heated, musty, mouldy, or weevily broom millet seed is, however, practically worthless for some kinds of stock.

### Uses for Different Kinds of Stock.

Where stock are kept (as with maize or other grain suitable for stock-feeding), the value of broom millet seed is, in most cases, greater on the farm where it is grown than when marketed. On account of the small size of the grain and its hardness, it is advisable to grind or crush it before feeding, except for sheep or poultry.

For farm horses, many farmers on the coast have found it an excellent substitute for maize, being nutritious and palatable when ground, but there should be no hint of damage by heating, or trouble will be experienced. With lucerne hay, which makes up for its deficiency in protein, the ground seed can also be fed to cattle.

For pigs the grain is improved by soaking—especially with skim milk, which helps to balance it as a ration, particularly for young stock.

At the present time, when grain is in great demand in the drought-stricken west, and not inclined to diminish in price, broom millet seed can well be substituted for maize for sheep. For this purpose it will not require crushing, but should be fed in a trough, as the grain is too small to be picked up effectively from the ground like maize.

For poultry it can be substituted in part for wheat or maize, and can be fed whole. This is the use it is most largely put to on the average farm where it is produced, and with the present prices of other grains poultry-farmers will find broom millet seed a comparatively cheap and efficient substitute if they can procure it of good quality. Mr. Hadlington, Poultry Expert, suggests that a good way to use the broom millet seed is to grind it to a meal and use up to 10 per cent. in the morning mash. Taking into consideration the factor of palatability when used in this way, it might be advisable to start with a smaller percentage at first.


**Fig. 1.**—*Chloris truncata.*

Note the blunt end to the flowering spikelet, which distinguishes this variety from *C. acicularis*. Also note the tendency to send out runners. A is the original root and A¹ a secondary root formed at the node of the runner.

# Popular Descriptions of Grasses.

[Continued from page 28.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

## THE CHLORIS GRASSES.

THE Chloris grasses are fairly common throughout the temperate and tropical portions of the world, and particularly so throughout Australia. Every pastoralist is familiar with the native grass commonly called Star or Windmill grass (*Chloris truncata*), and with the introduced grass called Rhodes grass (*Chloris gayana*).

The Chloris grasses are very easily recognised, being remarkably similar in inflorescence and somewhat similar in habit of growth. The inflorescence is characterised by spikes of flowers radiating more or less from a common centre; hence the name "windmill" commonly applied to these grasses. The flowers are closely arranged on the spikes, and a careful examination shows the presence of a fertile flower in close apposition to an infertile one. The seed harvested from Chloris grasses, therefore, has only an approximate 50 per cent. fertility, and it is this fact that gives Rhodes grass seed such a low vitality. A germination of 35 per cent. in the seed of Rhodes grass should be considered very satisfactory, as this means that 70 per cent. of the fertile flowers are viable.

In some of the Chloris grasses the flowers, on ripening their seed, turn black (well seen in *Chloris truncata*), and the seed then easily shatters. In Rhodes grass the seed commonly turns dark brown on becoming dead ripe, although flowers of a dark straw colour may also contain mature seed. The Chloris grasses that ripen their seed most readily are *Chloris gayana* (Rhodes grass), *C. truncata* and *C. ventricosa*, while others like *C. acicularis* and *C. divaricata* ripen their seed rather sparingly.

Practically all the Chloris grasses have a tendency to root at the lower nodes of the stems, *i.e.*, to send out runners. This is so well marked in Rhodes grass and *Chloris virgata* that the runners, under suitable conditions, may extend for several feet, and may root so readily at the nodes that several plants are produced from the original plant. This tendency to send out runners, although not so well marked in the native Chloris grasses, is still present, as can be well seen in the accompanying drawings. Plants that have not been interfered with by heavy stocking are often found to have runners of considerable length.

The Chloris grasses of greatest economic importance in New South Wales are :—

| NATIVE. | | INTRODUCED. |
| --- | --- | --- |
| *Chloris truncata* | Star or Windmill grass. | *Chloris gayana* (Rhodes grass). |
| *C. acicularis* | | |
| *C. ventricosa* | | *C. virgata.* |
| *C. divaricata* | | |


**Fig. 2.—*Chloris truncata.***

This is a form with short flowering spikes; it is not so common as the ordinary form illustrated in Fig. 1. Secondary roots are shown as $A^1$ and $A^2$.

### Native Chloris Grasses.

*Chloris truncata* is commonly called Star or Windmill grass, and it may be found on any part of the coast, tablelands, or interior. It will grow on both rich and poor soils, and is as abundant on the clay soils of the county of Cumberland as on the granitic soils of the South Coast or the rich alluvial soils of the interior. In the western districts the pastoralist welcomes its appearance in the early spring, when, with decent rains, its rapidity of growth is remarkable. Although it breaks into flower quickly, this does not appear to act to its detriment, as from a small plant it continues to grow in circumference until quite a large turf of the grass is produced in some cases. Stalks of flowers, however, are continually being produced, and this, combined with the short flag, makes it essentially a sheep grass.

Star or Windmill grass comes very quickly on land that has been cultivated. This is particularly evident on the wheat lands of the slopes and of New England, and on the Murrumbidgee Irrigation Area. On such soils it thrives much better than it does on uncultivated lands. Perennial rye pastures in New England will, after a few years, be encroached upon by this grass and by members of the Love grass family, but the grazing capacity of the land is by no means reduced thereby. Good Chloris and Eragrostis pastures will easily carry two sheep per acre during the summer months.

Like all other members of the Chloris family this grass is very sensitive to frosts. Its season is practically over after May, and it is not again seen until September or October. The seed is very fertile, but spasmodic in its germination. It is extremely difficult to establish a cultivated pasture of the grass. Its extension on pastoral land can, however, be easily effected by allowing it to seed. This is not a difficult matter, as it is continually seeding during the summer months. The period of setting flowers and ripening seed only extends over two or three weeks. Owing to its abundant inflorescence, the fertility of the seed, and the manner in which the seed heads are blown about by the wind, there is little danger (unlike many native grasses) of this grass ever being killed out in New South Wales.

*Chloris acicularis* (also called Star or Windmill grass) is confused by many pastoralists with the foregoing. It is easily distinguished, however, from *Chloris truncata* by its taller and more leafy flag, by its greater tussocky habit, and by the fact that the flowers are all needle shaped or aciculate, hence, in fact, its name. *C. truncata* is so-called because the flowers are "truncate," *i.e.*, they abruptly come to a point, thus giving the end of the flowers a blunt appearance. The distinction between the flowers of the two species can be well seen in the accompanying drawings.

*C. acicularis*, although fairly cosmopolitan in habit, is not nearly as abundant as *C. truncata*, which is probably due to the fact that the seeds of the spikes do not shatter so readily when ripe, nor are ripe seeds produced in such abnndance as in *C. truncata.* From a palatability point of view the grass is probably superior to the other native Chloris grasses in its young stage. When mature, however, its leaves are inclined to become rather


**Fig. 3.**—*Chloris acicularis.*

Note the "aciculate" or fine-pointed spikelets; also the tendency to send out runners. A is the original root. A¹ is the secondary root formed at the node of the runner.


**Fig. 4.**—*Chloris ventricosa.*
Note the boat-shaped inflated spikelet ; also the tendency to form a secondary root at A[1].

harsh. A very reliable correspondent reported last year on this grass as follows :—" It appears to be very valuable as a fodder. The whole of 1918 was a bad drought here, and there has not been one point of rain for the last thirty-seven days ; yet it is still growing."

It will pay pastoralists to protect this grass as much as possible, as it is likely to disappear under heavy stocking and if not allowed to seed.

*Chloris ventricosa* is sometimes called Tall Star grass. This is because of its tall habit, particularly in its flowering stages, by which it can be readily distinguished from the other native Chloris grasses. Like *C. acicularis*, the grass has a fairly wide range, but is by no means common. It occurs more abundantly in coastal districts than elsewhere, particularly north of Newcastle. The late Mr. Sylvester Browne went to some trouble in endeavouring to foster this grass, and harvested a large amount of seed. Pastoralists, however, have been slow in fostering its development, which is a matter for extreme regret, as the grass is an excellent one for both large and small stock. The seed germinates fairly readily, and under irrigation at Bathurst it produced a very large amount of feed. It is very partial to shady situations, and is often found in abundance on partially cleared land. It makes its best growth in early summer, and has a growing period somewhat similar to that of *C. truncata.*

*Chloris divaricata* has a flag very similar to that of *Chloris truncata*, and an inflorescence resembling that of *C. acicularis.* The flowers, however, are much more crowded along the spikes than in the latter. It is the least abundant of all the native Chloris family, but it appears to have a fairly wide range. It is not of sufficient economic importance at present to give it prominence above any of the other Chloris grasses.

(*To be continued.*)

## Sugar Beet Growing in England.

A definite effort is to be made to establish the sugar beet industry in England. That country is one of the largest consumers of sugar in the world, requiring £25,000,000 worth annually even on the prices ruling before the war. To carry out an experiment in sugar production on commercial lines a company is to be floated, with a nominal capital of £1,000,000, of which one-fourth is to be offered at once to the public, and a second fourth will be taken up by the Government to rank below the first for dividend. The first business of the company will be to erect a factory at Newark (Notts), and then to induce farmers in the district to grow sufficient sugar beet to keep the factory in full operation. An estate on which to conduct a central demonstration for local farmers has already been secured. With a preference of £6 4s. per ton over the imported foreign article and nearly £1 19s. per ton over the small amount received from the other parts of the Empire, the enormous market is regarded as offering a favourable opening.

# Farmers' Experiment Plots.

## Winter Fodders, Western District, 1919.

J. E. SYME, Inspector of Agriculture.

THESE winter fodder experiments are carried on in a two years' rotation with wheat, winter fodder and fallow occupying one year, and wheat the succeeding year. The object is to maintain the soil's organic content, which, in dry districts where alternate bare fallow and wheat is the general practice, is burnt or oxidised out under the heat of the sun, leaving the land poorer in fertility, with a lower water-holding capacity, and so compacted that cultivation is made difficult. The growing of these fodders also enables the farmer to increase the stock on the farm.

The fodders are planted as early as possible on the stubble land of the previous wheat crop, the stubble being grazed quickly and then disc-cultivated or spring-toothed and the fodders sown as soon as rain falls.

The season of 1919 was not conducive to any great growth, practically the only rain of any importance falling in February and May. The autumn and the preceding summer were so extremely dry that there was practically no moisture in the soil at all, even at a depth of 4 or 5 feet. However, all farmers conducting the trials were quite satisfied as to their value, as they provided green feed at a time when stock were perishing, and in many cases saved the lives of stock that would otherwise have died. So great was the scarcity of feed that stock were very often put on before the fodder had any chance to make much growth, and the feeding was extended far later than would have been wise in a good season, as it delayed the fallowing of the ground.

Mixtures of fodders were in most cases sown with the idea of finding the most profitable winter fodders for the western districts. Under the conditions that prevailed, Skinless barley and Golden tares gave the best results, the tares being most favoured by stock, which invariably cleared them out before tackling anything else. The season was too dry for rape, and it made very little growth. In the mixture of Sunrise oats and Egyptian field peas, the oats provided good feed right through, but the peas did not make much growth.

### Cultural Details.

The tests were carried out as follows:—

*M. F. Dalton, Duntry League, Orange.*—Land, grey to red basalt, 7 acres. Ploughed with mouldboard in March; harrowed and rolled; sown 21st March, 1919. Mixture (1), 3 bushels Skinless barley and 1½ bushels Golden

tares, 3 acres. Mixture (2), 2 bushels Sunrise oats and 1 bushel Egyptian field peas, 2 acres. Mixture (3), 2 bushels Huguenot wheat and 1 bushel Egyptian field peas, 2 acres. In each case 56 lb. superphosphate per acre was applied.

These plots carried twenty-two sheep for five weeks, forty sheep for six weeks, and ten head of cattle for three weeks.

*D. A. Rich, Wellington.*—Land, grey loam, 9 acres. Ploughed with disc plough in April and harrowed; sown first week in May, 1919. Mixture (1), 3 bushels Skinless barley and 1½ bushels Golden tares, 3 acres. Mixture (2), 3 bushels Sunrise oats and 1½ bushels Egyptian field peas, 3 acres. Mixture (3), 3 bushels Skinless barley and 12 lb. Dwarf Essex rape, 3 acres. In each case 56 lb. superphosphate per acre was applied.

These plots carried twenty-six pigs, forty-four sheep, four cows, and six horses for three months.

*E. J. Allen, Gregra.*—Land, heavy red soil, 14 acres. Ploughed second week in February about 4 inches; harrowed 1st March; sown 4th March. Mixture (1), 4 bushels Skinless barley and 2 bushels Golden tares, 4 acres. Mixture (2), 2 bushels Skinless barley and 8 lb. Dwarf Essex rape, 2 acres. Mixture (3), 4 bushels Sunrise oats and 2 bushels Canadian field peas, 4 acres. Also 16 lb. Dwarf Essex rape, 4 acres.

These carried twenty-five head of horses and cattle for about six weeks, but they grazed on it continually for three months.

*E. A. Draper, Harris Park, Alectown West.*—Land, heavy red soil, 16 acres. Disc-cultivated end of March; sown 2nd April. Mixture (1), 4 bushels Skinless barley and 2 bushels Egyptian field peas, 5 acres. Mixture (2), 4 bushels Florence wheat and 2 bushels Golden tares, 4 acres. Mixture (3), 3 bushels Sunrise oats and 6 lb. Dwarf Essex rape, 3 acres. Also 16 lb. Dwarf Essex rape, 4 acres. In each case 56 lb. superphosphate per acre was applied.

These plots carried six horses for a month, sixty-six sheep for six weeks, and 160 sheep for two months.

*J. Parslow, Kelvin Grove, Gilgandra.*—Land, grey loam, 16 acres. Spring-toothed twice in January, 1919; sown 19th and 20th March. Mixture (1), 4 bushels Skinless barley and 2 bushels Golden tares, 4 acres. Mixture (2), 4 bushels Sunrise oats and 2 bushels Egyptian field peas, 4 acres. Mixture (3), 3 bushels Skinless barley and 18 lb. Dwarf Essex rape, 3 acres. Also, 4 lb. Swedes, 1 acre; 16 lb. Dwarf Essex rape, 4 acres. In each case 56 lb. superphosphate per acre was applied.

The Swedes and rape germinated badly. The plots carried fifty-five sheep and twenty-eight lambs for twelve weeks.

*L. Broughton, Boyben, via Mendooran.*—Land, sandy loam, 15 acres. Ploughed end of February and beginning of March and harrowed; sown 10th and 11th March. Mixture (1), 4 bushels Sunrise oats and 2 bushels Canadian field peas, 4 acres. Mixture (2), 4 bushels Skinless barley and 2 bushels

Golden tares, 4 acres. Mixture (3), 3 bushels Skinless barley and 12 lb. Dwarf Essex rape, 3 acres. Also 16 lb. Dwarf Essex rape, 4 acres. In each case 56 lb. superphosphate per acre was applied.

These plots carried eight horses and one cow for three weeks and twelve horses and one cow for seventeen days.

RAINFALL during growing period.

| | March. | April. | May. | June. | July. | August. | September. | Total. |
|---|---|---|---|---|---|---|---|---|
| | Points. | Points. | Points. | Points. | Points. | Points. | Points. | Points. |
| Orange ... .. | ... | 47 | 325 | 106 | 123 | 208 | 227 | 1,036 |
| Wellington ... | ... | ... | 429 | ... | 34 | 134 | 50 | 647 |
| Gregra ... ... | 26 | 46 | 276 | 52 | 47 | 127 | 37 | 611 |
| Alectown West ... | ... | 31 | 313 | 57 | ... | 140 | 90 | 631 |
| Gilgandra ... .. | 45 | 39 | 444 | 26 | 55 | 79 | 33 | 721 |
| Mendooran ... | ... | 75 | 435 | 15 | ... | ... | ... | 525 |

## WINTER SCHOOLS FOR FARMERS, 1920.

ARRANGEMENTS have been made for the annual Winter School for Farmers to be held at Hawkesbury Agricultural College from 15th June to 10th July next. The syllabus covers a comprehensive course of lectures and demonstrations on agriculture, horticulture, live stock, &c., and in addition, practical training is available in useful work connected with farm life, such as saddlery, engineering, blacksmithing, carpentry, &c.

To meet a popular demand, a special school will be held for those who desire to specialise in the subject of poultry farming. All branches of the industry will be fully dealt with, and moreover, the students will be given an opportunity of studying such subjects in the general course as are likely to be of value to them.

Farmers or their sons, over 16 years of age, who have been engaged in rural work for at least one year, will be eligible for admission to the general course, and admission to the poultry course will be granted to persons of both sexes over the age named who are engaged in poultry farming.

Applications for both schools will close on 31st May, 1920.

The fee for either course, inclusive of board and lodging, will be £3 3s Prospectus and full information may be obtained on application to the Under Secretary and Director, Department of Agriculture, Sydney.

## HELPING ORANGE TREES TO SET THEIR FRUIT

"OUR navel oranges and late Valencias bloom well, but most of the young fruit drops off," wrote a correspondent recently. "One Valencia was a mass of blossom last spring, but only two oranges have remained on the tree."

"The best way to get citrus trees to set their fruit," replied the Fruit Expert, "is to keep the soil in good condition; even then they will not always hold the fruit. Some varieties of navel oranges are worse in this respect than others, but Valencia Late usually holds its fruit well."

# Soil Improvement for Maize.

## I.—Manures and Fertilisers.

[Continued from page 183.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

### Potash.

As has been shown, the demand of the maize crop on the potash of the soil is not particularly heavy, as most of this ingredient taken up by the plant is returned to the soil in the stalks and leaves when ploughed in or burnt. It is also a noteworthy fact that the subsoil generally contains a higher percentage of potash than the surface soil. By the decay of deep-rooting legumes or the manure from stock grazing such crops, this supply of potash can in part be brought to the surface soil, where it can be made use of by shallower rooting crops like maize. Most things considered, it seems that it is not essential to purchase potash in the form of chemical fertilisers for maize or for most maize soils, though in the case of some sandy loams markedly deficient in easily available potash this ingredient may require to be bought in small amounts for the maize crop. On reclaimed peaty swamp lands (excellent for maize-growing as a rule) the application of potash fertiliser is oft n necessary and highly profitable. The truth of this statement has been supported by both soil analysis and field experiments in Illinois,† where, it is stated, potash has increased the yield of maize from 10 or 20 bushels per acre to 50 or 60 bushels on thousands of acres of reclaimed swamp land.

As the carbonic and organic acids which are set free on the decay of organic matter have the power of releasing potash from its insoluble compounds in the soil, it is thought that on most maize soils sufficient available potash for the maize crop can be maintained by keeping up the supply of decaying organic matter in the soil. When this organic matter is allowed to be depleted, potash fertilisers may stimulate the growth of maize.

The following results with potash fertilisers on maize have been obtained in New South Wales :—

| | | Yield per acre. | | | | Increase or decrease from 28 lb. Sulphate of Potash. | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 cwt. Superphosphate. | | 1¼ cwt. P5 Mixture.* | | | | |
| | | bus. | lb. | bus. | lb. | bus. | lb. | |
| North Coast... | ... Average of 22 tests | 55 | 49 | 60 | 11 | 4 | 18 | increase. |
| South Coast... ... | " 6 " | 55 | 7 | 61 | 25 | 6 | 18 | " |
| Northern Tableland... | " 4 " | 26 | 22 | 25 | 10 | 1 | 12 | decrease. |
| North-West ... ... | " 3 " | 31 | 51 | 30 | 2 | 1 | 49 | " |

* P5 mixture consists of 1 cwt. Superphosphate and ¼ cwt. Sulphate of Potash.

† Illinois Farmers' Institute Report, 1911.

In spite of the favourable results on the coast, the writer maintains that farmers growing maize on the alluvial soils here can render the purchase of potash unnecessary for some time yet, if the supply of decaying organic matter in the soil is kept up by green manuring—preferably with legumes, for on soils where the yield is limited by a shortage of available nitrogen, potash fertilisers may stimulate leaf development and growth sufficiently to give a profitable increase. This is borne out by the fact that on soils in which decaying organic matter was definitely known to be present in sufficient quantities, potash manures have not given any increase in yield. This is directly shown at Coramba, where fertiliser experiments have been carried out for five years, and where no increase was recorded from potash fertilisers during the first two years, but where increases have been obtained from these fertilisers in later years—probably owing to the deficiency of decaying organic matter in the soil which naturally ensues with continued cultivation if no measures are taken to replace it.

With the high prices ruling for potash at present, it is recommended that no purchase be made of fertilisers for maize supplying this ingredient until the need for it is shown by actual experiment; even then, the soil should contain an abundance of decaying organic matter before any defini conclusions can be drawn as to whether potash fertilisers are required.

**Lime.**

Lime is not strictly a fertiliser, though it may in some cases act as a stimulant in producing larger crop yields. It should be regarded more as a means of improving the texture of soils—particularly heavy clay soils.

By promoting conditions favourable to nitrifying bacteria and thus rendering nitrogen in organic matter more readily available, lime hastens to some extent the decomposition of vegetable matter ploughed under and by chemical action sets free some potash from insoluble compounds. It also has some action in preventing the formation of insoluble (iron and alumina) phosphates where it is present in sufficient quantity in the soil to which superphosphate has been added. In very acid soils it promotes the growth of legumes, and thereby is a means of increasing the yield of the following maize crop on account of the greater amount of nitrogen and organic matter added to the soil when these legumes precede maize. In Alabama* an increase of nearly 3 bushels per acre of maize was obtained from an application of lime to velvet beans (for ploughing under) due to their increased growth.

As a direct application alone to the soil for maize, lime has not met with much success. The following results were obtained from the application of lime for maize on red soils in Rhodesia,† found to be distinctly acid :—

| | Yield per acre. |
|---|---|
| Unburnt lime, 1 ton per acre ... ... | 49 bushels 10 lb. |
| Quicklime, ½ ton per acre ... ... ... | 53 ,, 14 ,, |
| Untreated ... ... ... ... ... | 56 ,, 50 ,, |

* Alabama Agr. Expt. Sta. Bull. 111. † Rhodesia *Agr. Jour.*, December, 1918.

Nothing will exhaust the soil more quickly than lime if used alone. Bear and Salter* found that the use of quicklime in excess of the needs of the soil caused a loss of nitrogen, phosphorus and organic matter from the surface soil considerably larger than the increased yields produced would justify. When the organic matter is maintained and the supply of plant food material is kept up, the application of lime may be profitable. In America the cost of ground limestone (which is most largely used) is only about 5s. or 6s. per ton, while here this substance is quoted at about 30s. per ton, with agricultural (or air-slaked) lime at nearly double this price. This precludes the application of lime on a large scale in this State; but experiments are in progress to determine the value of lime on maize soils in those districts where the rainfall is high and where much loss of this substance from the soil may be expected on account of leaching.

### Do Commercial Fertilisers Impoverish the Soil?

In many districts the cry is heard from farmers that commercial fertilisers impoverish the soil. Such farmers argue that it has been their experience that once they start to use commercial fertilisers (especially superphosphate) they are compelled to continue the practice, for if they leave off, they find the yields poorer than on land to which no fertiliser had been applied. This is undoubtedly in many cases the truth, but its full significance has not been realised—it certainly does not constitute an argument in favour of no fertiliser; the fact that increased and profitable yields have been realised seems to have been lost sight of. As has been shown, fertilisers add to the soil only a portion of the plant food removed by the crops, with the inevitable result that the total plant food in the soil gradually decreases and the land itself is steadily impoverished under continuous culture or one-crop farming. But fertilisers supply this plant food in an easily available form, whereas there is a limit to the use which can be made of the plant food in the soil because of the large amount of it which is highly insoluble. This is mainly the reason why fertilisers give increased yields, and explains to some extent why fertilisers must be continued. The increased crops obtained from the use of fertilisers take more plant food from the soil than poorer crops grown without fertiliser; and it is the first business of every farmer (and an economically sound practice) to rob the soil of its fertility by making the land produce its utmost in crops. The farmer should recognise, however, that he cannot have his cake and eat it too. If he does not wish his land to become poorer, he should be content with poor crops.

Successive good crops of maize or other crops in continuous culture without rotation (whether due to good seasons, good cultivation or fertilisers) must make the soil poorer in available plant food, and this is what makes fertilisers necessary (especially phosphatic fertilisers, like superphosphate, bonedust, &c., because there is no other means of supplying the element phosphorus), and all the more necessary on soil to which fertilisers have been previously added. There can be no room for complaint so long as fertilisers give a

* West Virginia Agr. Expt. Sta. Bull. 160 (1916).

*profitable* increase in crop yields. The fertiliser merchant cannot be blamed for the poor yields obtained when fertilisers are discontinued, any more than Providence can be censured for sending good seasons which help to produce good crops and incidentally to make the land poorer.

There is the further complaint that superphosphate has the effect of "hardening" the soil, making it run together after rain and bake quickly, and thus accentuating the reduction in crop yield. This condition is explained by the same cause—that is, the more rapid exhaustion by the heavier crops of the soil's organic matter (of which nitrogen is a part), whereas poorer crops grown without fertiliser deplete this organic matter more gradually. In any case, the greater the moisture-holding power of the soil the more the fertiliser is likely to be made use of. The intelligent farmer will see to it that the soil retains its moisture-holding capacity by enriching it with organic matter from animal and green manures and crop residues. The land is thus kept in good tilth and full use is made of the fertiliser.

Strange as it may seem, the writer has met landlords who, on the above fallacious grounds, have absolutely forbidden their tenant farmers to use commercial fertilisers. Tenant farmers on short leases are in some cases loth to use fertilisers because they get no compensation for their residual values. Such farmers have no excuse for this attitude, even on the shortest lease, when they can be assured that the application of fertiliser results in a *profitable* increase in crop yields.

### Effect of Fertilisers on Maturity of Maize Crops.

The use of phosphatic fertilisers (particularly superphosphate) as an aid to the early maturing of the crop is a factor which has not previously been given the importance it deserves; in the Tableland districts the application of ½ to 1 cwt. superphosphate alone at planting has been observed to hasten the maturity of the maize crop by as much as ten days or a fortnight. In view of the fact that it is never known when extra early autumn frosts will occur, this is a big consideration. The damage done by these unseasonably early frosts depends on the amount of moisture in the grain at the time it is caught; not only do they reduce the yield because the grain does not fill, but the feeding value of the grain is also lessened. The action of phosphates is to hasten the formation and filling of the grain; and the use of superphosphate in cold climates at planting (which has the direct effect also of increasing the root development of the young seedlings, thus giving them a quick start) will do much to lessen the risk of damage which may be caused by early frost.

Bonedust does not appear to have this power of inducing early maturity in the same degree as superphosphate, and even a mixture of bonedust and superphosphate does not give as marked results in this direction as superphosphate alone. Nitrogenous fertilisers, like nitrate of soda and sulphate of ammonia, have, on the other hand, the effect of delaying maturity; and it is probably due to the small amount of nitrogen in bonedust that sometimes

a slightly later maturity is observed in the maize fertilised with it. When a later planting than usual takes place in cold districts, then it would be advisable to apply superphosphate alone at seeding, in spite of all other considerations.

**Residual Effect of Fertilisers.**

Although the amount of fertiliser usually applied to maize contains less plant food than is removed from the soil by the average crop, there is reason to believe that there is some residual effect from the fertilisers applied. In other words, we may expect some increase in the second or third years after application (though by no means as great as the increase during the first year). The establishment of this fact is the basis of the complaint by tenant farmers already referred to.

Nitrogen is the chief element lost from the soil by leaching, and though soils have the power of fixing ammonia salts to some extent, even these are converted fairly rapidly into nitrates during favourable summer conditions, and the soil then has no power over their retention, except when growing crops are making use of them. The loss from leaching is, of course, greater in districts of heavy rainfall and from sandy soils; and when these conditions are heightened it will be seen that a cover crop of some kind is an economical method of saving nitrogen. It will be apparent, therefore, that nitrogenous fertilisers like sulphate of ammonia and nitrate of soda are not likely to have any residual effect. Phosphatic and potash fertilisers lose but little of their plant food from the soil by leaching under ordinary conditions, though potash is lost to some extent from sandy soils under heavy rainfall. Fairly large quantities of lime are also removed from the soil in drainage or seepage waters. It is, however, chiefly from phosphatic fertilisers and organic nitrogenous manures like blood, bone, &c., that we can expect some residual value—even though the amounts of plant food supplied by these fertilisers is less than that removed by the crops from the soil, for the crops depend more or less on the plant food which is naturally contained in the soil and what part of this is made available.

Experiments are now in progress in this State to determine the residual effect of superphosphate on maize soils, but in the meantime the experience of other countries is worth quoting.

In Ohio* it was found that 51 per cent. of the increase from chemical fertilisers was realised in the crop to which the fertiliser was applied and 49 per cent. in the crops which followed, the increased yields extending for four years afterwards from a single application.

In Rhodesia,† on red soils, an increase of 46 bushels per acre was obtained as an aggregate of three seasons from one dressing of fertiliser costing 20s., practically no increase over the unmanured plot being obtained beyond the third year.

* Ohio *Mon. Bull.*, vol. 2, No. 2 (February, 1917).
† Rhodesia *Agr. Jour.*, August, 1917.

### Methods and Time of Applying Fertiliser.

Fertiliser attachments are fitted to most of the modern maize drills, and with regulators can be made to sow from ½ to 3 or 4 cwt. fertiliser per acre. Very few definite tests have been made to determine whether the application of fertiliser at seeding time is better than at any other time, but nearly all the increases for fertilisers quoted here have been obtained by such an application. It has been shown that top dressing maize with nitrate of soda has been tried unsuccessfully for the most part on the coast, but the experiment is being continued on the tablelands, where it may meet with success.

On the western slopes, where the question of soil moisture is the most important one in maize growing, it may be found that fertilisers applied to maize at planting have an undesirable effect in producing a vigorous growth of stalk which will be less able to withstand the dry weather it may experience later in the season, and thus the yield may be actually reduced by the fertiliser. Especially will this apply to soluble nitrogenous fertilisers, but it may also happen with superphosphate. For this reason the quantity of fertiliser applied to maize in these districts should be much smaller than that recommended for the coast, except, perhaps, in the case of fodder maize, where a heavy stalk growth is desired.

Some experiments to determine whether broadcasting the fertiliser or distributing it with a wheat drill before planting maize is any better than sowing in the maize drill in the ordinary way, have given negligible results in New South Wales, the yields being about the same from either method. In North Carolina* an average of 2·1 bushels per acre increase was obtained in favour of fertilising in the maize drill as compared to broadcasting. It may be that when heavy dressings of fertiliser are given it would be preferable to distribute it evenly by the wheat drill, but in those districts in this State where there is likely to be a wheat drill on the farm (that is, the tablelands and western slopes) it has been found that light applications of fertiliser give the best results.

Owing to absorption by the soil particles, very little downward movement of plant food like phosphates and potash takes place, and if these fertilisers are applied to the surface soil at a shallow depth a good part of them must be out of action in the cultivated surface soil mulch, except in a wet season when the maize roots, especially in the later stages of growth, approach nearer the surface. By putting these fertilisers in deeply better results might naturally be expected, for not only would they then be down where the plant roots feed, but they would stand more chance of being in moister soil and being thus made more available. That there is something in the deep application of fertilisers has been proved in North Carolina,† where fertiliser applied three times as deep (4 to 5 inches beneath the seed) as is ordinarily applied just before planting maize gave an average profit of 88 per cent. greater than applying the fertiliser in the drill at the ordinary

* North Carolina Agr. Expt. Sta., Circ. 8 (1913).
† North Carolina Agr. Expt. Sta., Bull. 229 (1915).

depth at planting. This is presumably done by setting the maize drill very deep and sowing the fertiliser alone first. Experiments are now in progress to determine the value of this method in New South Wales.

In some parts of America the fertiliser practice which has given the best results is that of applying the fertiliser to the crop that is grown especially for soil improvement. The application of 200 to 300 lb. superphosphate to the fodder crop or green manure crop preceding the maize crop has given much better returns than the same amount applied directly to the maize crop. This practice has not yet been tried in this State as far as maize is concerned, but should be worth testing. It may be mentioned that this method of fertilising has not proved a success here with wheat, but wheat is a crop for which soil improvement crops are not usually grown as they are for maize. The writer has observed the undoubted stimulating effect fertilisers have had on the growth of peas, vetches, &c., which have been grown for soil improvement on the coast; this, with the results of the fertiliser tests with superphosphate on lucerne during the past few years on the alluvial flats of the coast, may point to a new and efficient method of fertilising land for maize. The increased growth of the leguminous fodder crop adds more organic matter and nitrogen to the soil, and the maize crop depends for phosphates largely on the residual value of the phosphatic fertiliser applied to the fodder crop.

## Vary the Ration when Hand-feeding Sheep.

"Which of the feeds I have on hand would you advise me to use to hand-feed to Merino ewes due to lamb early in April, and to Merino lambs dropped in April and May of last year?" asked a Walla Walla pastoralist recently. "I have prime green wheaten hay with good grain in some sheaves, prime oaten hay cut fairly ripe with plenty of grain in it, and Algerian oats. The sheep have hay stubble and other cultivation with a little dry grass to run on, and plenty of good water and salt. To keep up their strength and condition for lambing, I commenced to feed on the wheaten hay (about ½ lb. hay per head) a fortnight ago, but neither ewes nor lambs are doing well. Their bellies appear full, and they are weak in their limbs, fall easily, and have difficulty in getting up. A few ewes and lambs have died during the last week."

"The ewes should have done fairly well on the food supply mentioned, provided the hay was of good quality," replied the Sheep and Wool Expert. "I would advise bringing the ration up to 1½ lb. of chaff per head per day and adding ½ lb. bran; the ewes may be suffering from impaction from being on dry feed so long. You might add 6 per cent. Epsom salt to the salt lick. In the event of it being necessary to continue hand-feeding, a ration consisting of 1½ lb. chaff (wheaten or oaten) and 1 lb. lucerne hay may be supplied as a change of feed.

"It would be better to have the hay chaffed than to feed it whole to the sheep. The secret in hand-feeding is to change the ration as frequently as possible. Sheep seem to sicken if left too long on the same class of food, and by alternating the lucerne with the bran and chaff they may be carried along in good health for a longer period."

# Chats about the Prickly Pear.

## No. 3.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist and Director, Botanic Gardens, Sydney.

### Prickly Pear as Stock Food.

THIS is pear's major use, beside which all others sink into insignificance. I repeat the advice that, while we are searching out some insect or fungus antagonist which may help us to cope with this dreadful weed, we should be careful that we do not lose valuable time for the sake of what may turn out to be a will-o'-the-wisp.

### Synopsis.

Absolute Destruction only an Ideal.
Select Bibliography.
Burning off the Spines and Spinules. (1) Singeing with Brush. (2) Singeing with a Torch.
Handling the Pear; a Fork.
Chopping the Pear.
Steaming Pear.
Pear as Ensilage.

### Absolute Destruction only an Ideal.

With most people in Australia absolute destruction of prickly pear is an ideal. If the matter came into politics, the candidate who could promise elimination of the plant would receive an almost unanimous Australian vote; not quite unanimous, however, for I have found, particularly during the present drought, that some landowners who were severely antagonistic to it during the drought of 1902 have become more tolerant of it during the drought of 1919. A number have told me they could not carry through a drought without pear, although most say they have too much.

Following is the opinion of a high American authority, Dr. D. Griffiths, in U.S. Bulletin 74, p. 36, referring to his own country :--

> It has been but a few years since the ranchers in the pear sections of Texas were inquiring anxiously for some method which could be successfully employed in ridding the native pastures of what was considered an absolutely worthless and injurious weed—the prickly pear. It was asserted that the pear, like the mesquite (*Prosopis glandulosa*) and guajilla (*Acacia Berlandieri*), was spreading rapidly and would soon overrun and greatly injure, if not destroy, large areas of pasture land. But this was before the combination of pear and cotton-seed meal as a stock feed was appreciated. To-day the occasion for the destruction of the pear does not exist, and an absolute destruction would be a calamity indeed.

The foregoing notwithstanding, there is hardly anyone who would not welcome any means by which the pest might be cleared out of the land, and who indeed would not admit that that would be a desirable termination

of the difficulty. No one, I suppose, would contemplate the toleration in Australia of the weed if any method, sound economically, could be found for its destruction.

### Select Bibliography.

The following pamphlets bear on prickly pear as a forage plant :—


1894. "Projet d'Enquête sur le Cactus, considéré comme plante fourragère." (*Revue Tunisienne.*) By Paul Bourde.

1896. "Plan of an enquiry into the merits of Prickly Pear as a forage-plant." *Agricultural Gazette*, October, 1896, p. 651. A translation by J. H. Maiden of the preceding.

1905. "The Prickly Pear and other Cacti as food for Stock." Bulletin No. 74, Bureau of Plant Industry, U.S. Department of Agriculture. By David Griffiths.

1906. "Feeding Prickly Pear to Stock in Texas." Bulletin No. 91, Bureau of Animal Industry, U.S. Department of Agriculture. By David Griffiths.

1906. "Prickly Pear and other Cacti as food for Stock (2)." Bulletin No. 60, New Mexico College of Agriculture, &c. By David Griffiths and R. F. Hare.

1907. "Summary of Recent Investigations of the Value of Cacti as Stock Food." One of the "Miscellaneous Papers" comprised in Bulletin No. 102, Bureau of Plant Industry, U.S. Department of Agriculture By David Griffiths and R. F. Hare.

1908. "The Prickly Pear as a Farm Crop." Bulletin No. 124, Bureau of Plant Industry, U.S. Department of Agriculture. By David Griffiths.

1915. "Yields of Native Prickly Pear in Southern Texas." Bulletin No. 208 of the U.S. Department of Agriculture. By David Griffiths.


### Burning off the Spines and Spinules.

For particulars, with two illustrations, see U.S. Bulletin No. 74 (1905). These are reproduced at Plate XI of the *Queensland Agricultural Journal* for August, 1908.

(1) *Singeing with Brush.*—This is the natural and primitive method, where scrub and timber are burnt, and by means of the fire thus created the spines, &c., are burnt off the pear. A pear-fork is used for handling the mass. Obviously this method depends on the care and skill of the operator. I have no doubt, however, that this method will always be in use more or less where fuel is plentiful.

In the Sydney *Daily Telegraph* of 1st August, 1913, is shown a small furnace burning pear at Riversleigh, Pallamallawa, New South Wales. The apparatus is cylindrical, hand-propelled, and mounted on wheels. The cylindrical furnace has a revolving fan at the back to create a draught, and the fuel is wood. A tongue of flame is projected on to the clump of pear.

It is an improvement on the old brush-fire method, but the apparatus is more cumbersome than those in which liquid fuel is used. Following are reports from Stock Inspectors in February, 1920, on the subject :—

The burner was used to some extent when it first came on the market. I watched it fairly carefully and came to the conclusion that it was of no practical use for the destruction of pear, and that as a method of converting pear into stock feed it was a failure.—C. BROOKS, Scone.

I have never seen the burner at work, and the only landholder who has tried the process is Mr. Boydell, of Weetah, and he does not consider the process practical. The cost of labour is too great, as the process requires two or three men to operate, and to keep up the supply of wood required. There have been during the present drought large numbers of cattle running on the pear areas about Pallamallawa, but the process has not been in operation.—H. N. COPELAND, Moree.

The Chief Inspector of Agriculture (Mr. McDonald) states that, apart from the labour required, stock do not care for pear singed by this apparatus. This is probably due to the objectionable flavour caused by the smoke from the wood fire. [At the same time brush-singed pear is often eaten by stock.—J.H.M.]

(2) *Singeing with a Torch.*—The first publication before me as to the use of the gasoline torch for singeing pear is a single-page leaflet written by the well-known botanist, J. J. Thornber, and issued by the University of Arizona Agricultural Experiment Station, U.S.A. It is one of the "Timely Hints for Farmers" (No. 52), and is dated 4th May, 1904. It draws attention to the Beever and Hindes (a Texas firm) prickly pear burner constructed on the principle of the plumber's gasoline torch. The note was a preliminary one, but spoke most hopefully of the possibility of converting pear into cattle-food at a reasonable rate.

Then we have the following information (with a figure) at page 13 of U.S. Bulletin No. 74 :—

The use of a gasoline torch for removing the spines of the prickly pear—and it is applicable to other species of cacti—originated in Texas. [Pl. I, fig. 2, not reproduced.] This is a common practice in vogue upon the range [in the bush.—J.H.M.], and is to be recommended as economical in both the utility of the feed and the labour of preparing it. The process consists in passing a hot-blast flame over the surface of the plant, which can be very quickly done at small expense. The spines themselves are dry and inflammable. In many species one-half or two-thirds of them will burn off by touching a match to them at the lower part of the trunk. The ease with which they are removed depends upon the condition of the atmosphere, the age of the joints, and the number of the spines. A large number of spines is very often an advantage when singeing is to be practised, because the spines burn better when they are abundant. The instrument used for this purpose is a modified plumber's torch. Any other convenient torch which gives a good flame can be employed, the efficiency depending upon the lightness of the machine and the ease with which the innermost parts of the cactus plants can be reached by the flame.

In Southern Texas two excellent torches . . . . are commonly used in singeing the prickly pear. In Arizona one or two ranchers consulted have used an ordinary kerosene torch with moderate success in handling the tree cacti of that region. With the use of these machines there is no labour involved in the feeding, except that of removing the spines by the passage of the blast flame over the surface of the joints. The cattle follow the operator closely, and graze all the joints which have been singed.

Then early in 1910 the Queensland Lands Department imported six of the Beever and Hindes (known in the trade as "B. and H.") pear torches. The following statement was made in the Australian press at the time :—

In Mexico 8,000 of these singers are used daily, and this method has been the means of saving the cattle from starvation and thirst during long protracted droughts. It is

stated that one man can singe in a day sufficient pear to feed 300 head of cattle for that period, at a cost of about £1 (8s. for a man's wages, and 12s. 6d. for sufficient naphtha for the day's work). This works out at less than 1d. per head per day for fodder.

I need scarcely remind my readers that these are pre-war figures.

Later on in the same year (1910) the New South Wales Lands Department borrowed one of the B. and H. pear torches from the Queensland Lands Department. It was lent to Mr. R. Alexander, of Bulga, in the Singleton district, who reported in 1912 :—

I find that the prickly pear torch that you kindly sent me is a great success. In the early part of the winter, when feed is dry, and there is very little of it, the cattle eat the pear readily after the thorns are burnt off. The noise of the torch entices the cattle from all parts of the paddock.

In this *Gazette* for March, 1913, p. 243, is an article by H. C. Coggins, in which is a photograph of a man scorching pear by means of one of the torches imported by the Queensland Department of Lands. As far as the outline of the apparatus is concerned, it is a clearer picture than that of Pl. 1, fig. 2, of U.S. Bulletin No. 74.

Mr. Coggins makes the following comments :—

It is estimated that one man with a machine can burn enough pear in one day to feed 350 head of cattle ; each beast will consume on an average 150 lb. of pear per day. The burner will consume 6 to 7 gallons of gasoline at a cost of 1s. 6d. per gallon.

Great care should be taken to keep stock away from water immediately after feeding on pear, as bloat is caused, and although it does not affect cattle used to pear to any great extent, it is dangerous to stock fed solely on pear for the first time. All stock should be gradually accustomed to pear.

Experiments carried out in this State prove that the machine is of great value in times of drought when fodder is scarce. Messrs. Alexander Bros., of Bulga, N.S.W., speak very highly of it, and state that they had 276 store bullocks during the drought, the whole of which were fed on pear for a period of six months, and fattened on this fodder alone. Messrs. Alexander Bros. say that the burner is a great success when feed is scarce.

A machine was also lent to Mr. H. Munro, of Keera Station, Inverell, and he considers that it is an excellent machine for the purpose required of it—that is, to destroy the thorns so that stock may cultivate a habit of eating the pear, and thus check the growth and seeding.

In U.S. Bulletin No. 74 already quoted, at p. 19, are found details of the design of the two pear burners on the market. They are very similar, and principally consist of a strong, well-riveted metal tank (which is supported upon the operator's shoulders by a strap), a long delivery pipe, and a burner for generating and consuming gas from the gasoline. They are best handled in calm weather, but in neither case is their use attended by any danger.

### Handling the Pear ; a Fork.

On the principle that we should learn all we can from our American friends, whose country is the home of the prickly pear, and where there is infinitely more experience in handling the pear than with us, I give a sketch (Fig. 1) and particulars of a simple instrument, taken from U.S. Bulletin No. 74, p. 13 :—

In some cases a specially-constructed fork is used by the freighters. This instrument has a handle much like an ordinary pitchfork ; the tine, however, is single, short, stout, and sharply curved, with a stout buttress or projecting arm at the base to prevent the soft joints, through which the instrument is thrust, from sliding upon the handle when raised above the operator in the act of pitching upon the waggon. None of these was seen upon the ranges, but such forks were commonly used by the wood-choppers and freighters.

The vast majority of the Mexicans use a forked stick, and this is the only method of handling which was observed in old Mexico, where pear feeding is very extensively practised.

Fig. 1.—A Pear Fork.

## Chopping the Pear.

This is discussed at some length in U.S. Bulletin No. 74, at p 16; the matter is so important that the possibility of improved machines for the purpose is a question well worthy of the Australian inventor's attention. I have seen pear chopped for dairy cows many a time, but the ordinary chaff-cutter has been employed, and the pear has not been cut very fine. This method is, for other reasons, out of date.

In southern Texas, Dr. Griffiths (U.S. Bulletin 74) informed us in 1905 (fifteen years ago!), that two machines to which he draws attention are both set so as to cut the pear into 1-inch or 1½-inch pieces He says:—

Owing to the succulent nature, the whole thing is practically macerated in the operation. It is the practice to set these machines up in the pastures convenient to pear and water. The pear is cut down, hauled to the machines in waggons or carts, chopped, reloaded, and hauled out again to be fed in troughs constructed for that purpose.

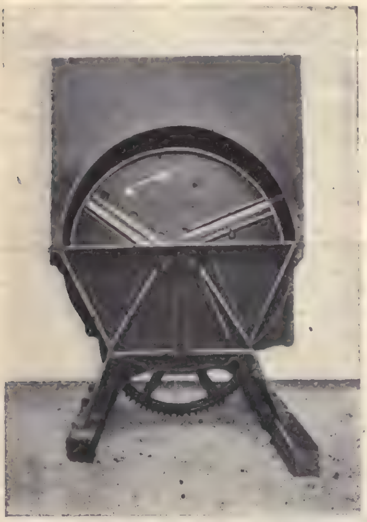
For the particulars and accompanying illustrations of these machines we are again indebted to Dr. Griffiths' bulletin. Fig. 2 shows a machine that consists of a solid cast-iron wheel, 4 feet in diameter, with two knives arranged at a narrow angle with the radius on one of its faces. Behind each

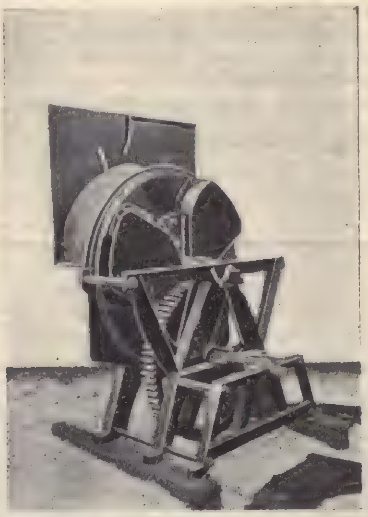
Fig. 2.—A type of Pear Cutter in use in Texas, U.S.A.
Feed platform and chute on the left, and carrier or elevator to the right.

knife, hollowed out of the face of the solid casting, there is a pocket extending the length of the radius. The front face of this wheel is plain, save for these pockets, which receive the chopped pear, and carry it out of the machine. The knives are bolted on to the face of the wheel over the pockets,

and in revolving pass an adjustable shear plate which is bolted into the frame. The pear is forked into a chute that feeds it against the face of the wheel, with its revolving knives, and is cut and mashed into small pieces. The chopped material is carried down in the pockets and dropped into a carrier that carries the chop into the receptacle provided. The design of the driving gear allows for the operation of the machine by either horse or steam power.

As shipped from the factory, the machine can be improved by the attachment of certain labour-saving devices; for instance, a platform of sufficient size to hold one day's feed of uncut pear can be erected on the cutting side (and opposite the horse-power) to reach up and partially surround the wheel. From the platform the pear is fed into the chute, by which it is directed on to the knives. Under the elevating carrier is constructed a triangular box of about the same capacity as a double waggon box. On the lower end of this is a trap gate which can be sprung so as to allow the chop to slide into the waggon without handling.





**Another type of Pear Cutter**

**Fig. 3.—Front View, showing knives**

**Fig. 4.—Rear View, with casing removed, showing boxes behind the knives.**

The cost of this machine, together with the additional construction, was 125 dollars in 1905. It is estimated that by its use ten men could, with pear conveniently to hand, cut a full ration for 2,000 head of cattle, the machine being operated ten hours a day, and four horses furnishing the power. It is calculated that the machine can be run by two horses, but four operate it to better advantage, especially if much heavy, old pear is being cut.

The second machine (shown in Fig. 3) differs from Fig. 2 in being constructed throughout of iron, in being smaller and more compact, in having the boxes behind the knives removable, and in utilising the centrifugal force

of the wheel in discharging the chop. If the cutter is run with an engine this force delivers the chop into a waggon, but horse-power and unsteady feeding make the motion less uniform and necessitate the shovelling of the chop. This machine, it is claimed, will chop 20,000 lb. of pear an hour. The spines become thoroughly broken up in passing through it, and, being lighter than the pulpy material, are largely winnowed out when the chop passes out of the machine. A platform and feed chute can be constructed similar to that described in connection with the first machine.

Other machines are reported in this same bulletin to be very efficient. There is little about them to wear out, and they are said to last indefinitely.

### Steaming Pear.

I do not know when the process of steaming prickly pear was begun in Australia ; I saw it on the Upper Hunter during the drought of 1902, and have no doubt it was in use long before. Following is a note, dated 28th February, 1906, on the brick-kiln method in the Upper Hunter, which had then been in use some years :—

> I have forwarded a specimen of prickly pear prepared for feeding cows by a local dairy farmer. The process adopted is to prepare a hole in the ground, on the same principle as a brick-kiln, lighting the fire underneath so as to steam the pear with the moisture from the plant.
>
> As may be noted, this method seems to fairly successfully dispose of the small prickly spines and large spikes. I may add that it is served with bran or pollard, and Mr. Gardiner (the dairyman) claims that, prepared in this way, it is a good substitute for ordinary fodder.—JOHN S. CHEESBROUGH, Inspector, Muswellbrook.

In the next article will be given a brief account of the method adopted in the Camden district. An object is to soften the relatively powerful spines, and also the irritating spinules, which are really more troublesome to stock than the spines. I have known a little washing soda added to the pear to soften the spines.

Following is a note from U.S. Bulletin No. 74 (1905), showing that the steaming process is in use in the United States :—

> So far as known, Mr. J. M. John, of Hoehne, Colo., is the only rancher who has practised steaming cactus for cattle in this country. Mr. John discovered, by accident and without any knowledge of Australian practices, that the spines became innocuous when moistened for some time. He happened to use the plants in the construction of a dam, which soon washed out. Upon repairing the dam it was discovered that the spines of those plants which had been kept wet were perfectly harmless. This suggested that hot water or steam would accomplish the purpose in a much shorter time. Acting upon this suggestion, he fitted up a tank and boiler, which happened to be on hand, for the purpose of steaming the cactus. The tank employed was an open one, holding two loads, or, approximately, 6,000 lb. of cactus. In order to prevent the loss of heat as much as possible, corn chop, which was to be fed with the cactus, was poured upon the top of the loaded vat. This mixture was steamed for about ten hours, allowed to stand one night, and fed in the morning, with good results during one or two winters. It should be stated that all of the liquid was lost. This was a pure experiment, adapted to local conditions, and material convenient for the operations. The form of tank, the length of time, and the consequent expense of keeping up steam, could be greatly improved upon.

### Pear as Ensilage.

An article by Mr. W. L. Boyce, Lochinvar, entitled "Prickly Pears as Fodder," appeared in this *Gazette* for April, 1897 ; in it the writer gives an

account of his experiments in feeding the pear to his dairy stock, a flood in the Hunter having destroyed the standing crops. His description of his experience in cooking the pear is very much the same as the later experience in the Camden district to be described, and should be carefully read. Speaking of the utilisation of pear for ensilage the writer tells how he made a stack of green maize, sorghum, and twenty loads of prickly pear. In the *Gazette* for the following July, p. 504, Mr. Boyce describes his further experience as follows :—

In my article in *Gazette* of April last I mentioned that I had included twenty loads of prickly pears in a stack of ensilage with maize and sorghum. I now have the pleasure of forwarding you a sample and reporting unqualified success. The cattle like the pears quite as well as the other constituents of the ensilage, and prefer these pears to the steamed pears, which I am still giving them.

The ensilage was made in a stack in the open, and pressed with home-made mechanical appliances and covered with iron. Owing to the drought the stack is only a small one, which makes my present triumph the greater. The base of the stack is 19 ft. x 16 ft. 6 in., and only 3 feet high in its compressed state. I estimate that the pears amount to one-third of the whole stack. In building the stack I put alternate layers of pears and maize and sorghum, four loads of pears in one layer, but never allowing the pears to be nearer than a foot to the edge.

At present I am feeding the cows on this ensilage, steamed pears, and barley, all on the same day. There is also a good picking of green herbage, yet everything is eaten up clean. The milk test is at present 4 per cent. of butter-fat, which is amongst the highest at my creamery.

Now, as this ration has a good proportion of prickly pear the facts stated prove that there is considerable virtue in the much despised prickly pear. It only remains for me to add that the pears were placed in the stack whole, including thorns and roots, the largest bunches being afterwards chopped to flatten them. The heat and ferment of the silo has softened the thorns and rendered them harmless. I always add a bag or more of coarse salt to a stack to make the fodder more palatable.

Other stock-owners in different parts of this State and Queensland have experimented in the same direction, but I cannot learn that pear silage is a success.

In the *Cape Agricultural Journal* for January, 1900, p. 52, is a record of a small and not altogether satisfactory experiment with prickly pear and mealies (maize). Although the editor asked for records of further experiments, none were forthcoming.

Experience in the United States is not favourable :—

The Messrs. Furnish, of Spofford, Texas, attempted it one year, but on account of the improper construction of the silo nothing came of the experiment.

There is but little use in the preparation of ensilage from cactus. One can always gather this plant in the green state at any time of the year, and the object of going to the trouble and expense of placing the material in a silo is not very evident. Apparently there is little or nothing to gain, and the expense is considerable. The only way in which this can be made profitable is to mix the chopped pear with some other much drier feed in the silo. (U.S. Bulletin 74, 1905.)

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A SAMPLE of grit, submitted to the Department for examination as supposedly poisonous to pigeons, was found on analysis to contain 3·35 per cent. of common salt. An excessive percentage of salt in the food has frequently been found to be injurious, especially to poultry, and probably it was the cause of the trouble in the present instance. The grit should be washed before being supplied to the pigeons.—F. B. GUTHRIE.

# Dairy Produce Factory Premises and Manufacturing Processes.

## THE APPLICATION OF SCIENTIFIC METHODS TO THEIR EXAMINATION.

[Continued from page 264.]

L. T. MACINNES, Dairy Expert, and H. H. RANDELL, Assistant to the Biologist.

### Example 2.

IT had been noted that the choicest quality butter manufactured in a certain large factory, while true to description as regards quality immediately after manufacture, soon began to show signs of deterioration, and when kept in cold storage for any lengthy period became unmistakably "off" in flavour and aroma.

As a result of the series of examinations made at different stages of the manufacture, it was ascertained that while the pasteurising of the cream was effectively done, in that the bacteria were practically all killed, yet this same pasteurised cream, on being put into the churn, was found to be contaminated in the same manner as when first received at the factory. On inquiry it was found that the manager, following out advice he had received, was using a quantity of high acid unpasteurised cream as a "starter" for that which had been neutralised and pasteurised. The "starter" cream was found to contain similar germs to those in the bulk of the supply, and as a consequence the work and expense of pasteurising were being nullified. On the plates being shown and the matter explained, the factory manager at once discontinued the practice.

Selecting special cans of cream from the general supply to be used as "starters" in this way is a very dangerous procedure; even with the most skilled operator mistakes must occur, and it should be discontinued wherever it has been in vogue. In propagating and using "starters" there is no room for guess-work.

This factory, as in the previous example, is an old one erected some twenty years ago, but in a better state of repair and kept in a much more sanitary condition. The design is similar, and likewise there are a number of rooms on the first storey. The main walls and partitions, as also the ceilings and the upper floor, are of wood. The walls and ceilings right throughout the factory had been whitewashed with freshly-slaked hot lime a few days previous to our inspection. This fact had a great bearing on the small counts found in the atmospherically exposed plates, as the application of the

hot lime would have the effect of destroying many organisms—especially mould growths—for the cultivation of which the medias used were specially selected.

The cream treated at the factory was in all cases delivered by road vehicles—in a few by carriers plying for hire, but mostly by the dairy-farmers themselves. In transit from farm to factory it was held in 6 or 8 gallon cans, mostly of tinned steel and in good condition. The bulk of the supply was received before midday. On arrival each can was weighed, sampled for testing, and graded for quality. The cream receiving platform was open to the yard, and there was no partition between it and the receiving vats, pasteuriser, and pipe-cooler. After passing over the ground-floor cooler the cream was pumped up to another cooler on the next floor, immediately overhead, and from there taken in an open fluming to the holding vats, which were fitted with coils in order to regulate the temperature and bring it down as required for churning. This is necessary in the summer time, as the cream remains in these vats overnight, being churned the following morning.

The upstairs cooler was placed in a small gable-end room with low ceiling, through which was an air shaft; further ventilation was provided through a glass window, which was kept open, and through which a good breeze was blowing at the time the plates were exposed. The attemperator vats were placed in an adjoining room of much larger size, but also with low ceiling. These vats were immediately over the churns.

The cream examined was received in good condition and was closely graded by the Department's officers, and found to be of choicest quality. It will be seen from the plate B1 that much latent infection was present. The great number of organisms of the coli group demonstrate contamination at the cow-yard and bails; other types present indicate that the cows had in some cases access to swampy ground and pools of stagnant water. In B2 it is shown that heating to 182 degrees Fah. practically sterilised the cream and made it possible to manufacture from it a high-grade, good keeping butter, thus proving that extreme care had been exercised in efficiently carrying out pasteurisation. Untreated in this way, such cream would make a butter that would deteriorate to a very low quality within a week.

This care, with all the work and expense attached to it, was largely taken in vain, because of the practice (already referred to) of adding unpasteurised cream as a "starter" (see B3), the sharp acid flavour of which covered up similar latent pollution to that previously destroyed in the bulk of the cream by the pasteurising process. This infection was found in the butter when marketed, and was mainly responsible for reducing its grade, when made, from 43 points for flavour (choicest quality) to 38 points (or second grade and unfit for table use), some six weeks afterwards. In the interval this butter was kept in cold storage at 10 degrees Fah.

It will be seen from plate B5 that the water used for washing the butter contained liquefiers, gas formers and moulds. This water could be made

much better by being thoroughly filtered—for example, through cotton wool or felt pads. Filtering is especially necessary where, as in the present case, the watercourse is accessible to stock which wade in it when drinking, and open for surface infections lying about the surrounding watershed to be washed into it by rains.

TABLE II.—Showing Numbers and Kinds of Micro-organisms found in 1 Gram (1 c.c.) of the following samples.

| | Total Micro-organisms. | Gelatin Liquefiers and Casein Digesters. | Acid and Acid Coagulating. | Acid and Gas Formers. | Alkaline and Inert. | Yeasts. | Moulds. |
|---|---|---|---|---|---|---|---|
| (B1) Cream before pasteurising.. | 108,355,000 | 30,000 | 107,000,000 | 1,312,000 | 6,000 | 5,000 | 2,000 |
| (B2) Cream immediately after pasteurising .. .. .. .. | 14,480 | .... | 14,480 | .... | .... | .... | ... |
| (B3) Cream 20 hours after pasteurising and immediately before churning .. .. | 20,448,000 | 120,000 | 20,000,000 | 118,000 | 200,000 | 10,000 | 2,000 |
| (B4) Butter in box after packing | 4,246,100 | 33,100 | 4,200,000 | 1,000 | 3,000 | 7,000 | 2,000 |
| (B5) Butter-wash water .. .. | 22,800 | 8,800 | 5,200 | 6,400 | 1,400 | .... | 1,000 |
| | No oidiums were present. | | | | | | |

*Sample B1—Cream before Pasteurising.*—The sample for plating was collected from the bulk in the cream-receiving vat by means of a sterile pipette. Each can of this cream had been graded choicest quality, then thoroughly mixed in the cream-receiving vat of 300 gallons capacity. The acidity was determined at 0·44 per cent. lactic acid. From the plates it is shown that 1 c.c. of cream contained 108,355,000 micro-organisms, in which *Bact. lactis acidi*, a desirable type, was the predominant organism. There were also present 30,000 peptonising bacteria including varieties of micrococci, sarcina, cladathrix and *Bact. fluorescens liquefaciens*, and 1,312,000 organisms of the coli group or undesirable lactose fermenters. Their presence in such large numbers is undoubted evidence of heavy pollution by fæcal contamination. Among the acid and acid coagulating bacteria were 7,000,000 streptococci, the cells being oval and in long chains. Although these organisms coagulate milk, on account of their resemblance to a pathogenic variety they are regarded as undesirable. There were 6,000 chromogenic micrococci which made litmus milk alkaline but were unable to liquefy gelatin ; these may be classed as inert. Some 5,000 colonies of yeast were counted, while the 2,000 mould growths were *Penicillium* sp.

*Sample B2—Cream immediately after Pasteurising.*—The sample for plating was collected by means of a sterile pipette immediately after being discharged from the outlet pipe of the pasteuriser. The cream had been neutralised to 0·24 per cent. acidity with lime and pasteurised by means of the flash system, where a temperature of 182 degrees Fah. was reached for a few seconds ; then cooled to 54 degrees Fah. by passing over pipe-coolers. It will be seen from the figures in Table II that 108,355,000 micro-organisms in 1 c.c. of the cream were reduced by pasteurisation to 14,480 ; of these none were able to liquefy gelatin. Litmus milk was slowly made acid and

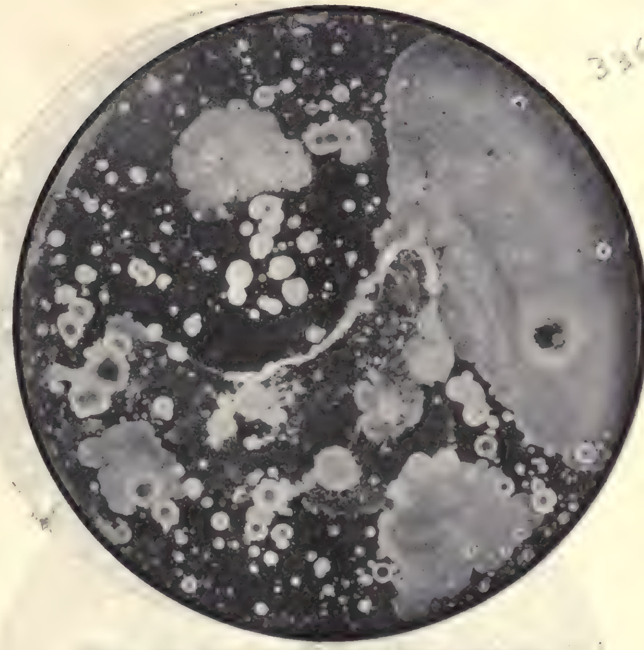
eventually coagulated. The organisms were all rod forms, growth on all media being slow; stained preparations from old cultures showed metachromatic granules, but spores were not found.

*Sample B3—Cream immediately prior to Churning.*—The cream after being pasteurised and pumped over the pipe-coolers was run into attemperator or holding vats, where it was left overnight at 57 degrees Fah. Selected cans of cream were added as "starter." These cans were chosen on account of the clean acid flavour of the cream. While this desired acid flavour would be caused by ***Bact. lactis acidi***, a harmless and necessary type, it is evident that the conditions which allowed the entry and development of this desirable organism would also be favourable for the entry into the milk and cream of many undesirable types. The plates clearly indicate this, as it was ascertained that 1 c.c. of the cream contained 20,448,000 micro-organisms. Although 20,000,000 of these were "lactics," or desirable lactose fermenters, there were also 448,000 per c.c. of undesirable organisms, comprising 116,000 undesirable lactose fermenters or organisms of the coli group, 100,000 of the proteus group (a putrefactive type), 20,000 *Sarcina lutea*, 10,000 yeasts, and 2,000 moulds. There were also counted 200,000 bacteria, which were unable to liquefy gelatin, and which, when inoculated into litmus milk, caused alkalinity or no apparent change in ten days; these were both spherical and rod forms.

*Sample B4.—Butter in the Box after Packing.*—The cream from the attemperator or holding vats was gravitated over pipe-coolers and churned in a combination "Simplex" churn at 51 degrees Fah. The sample for plating was taken from the near surface butter as packed in the box, by means of a sterile measure. From the plates it was shown that one gram of butter contained 4,246,100 micro-organisms. They included many of the types found in the cream prior to churning, the numbers, however, being considerably reduced, many having been carried away with the buttermilk and wash waters, as a comparison with the butter-wash water will show. Of the total bacterial content 4,000,000 were "lactics," or desirable lactose fermenters; 200,000 micrococci produced acid in litmus milk, but failed to coagulate it in ten days. The 33,100 gelatin liquefiers included *Bact. fluorescens liquefaciens*, *Staphlococcus aureus*, *Sarcina lutea*, *Bact. proteus*, and *Bact. lactis aerogenes*; 3,000 bacteria were considered inert, being unable to liquefy gelatin or cause only alkalinity when inoculated into litmus milk, 7,000 were yeasts, and the 2,000 mould growths were species of *Fusarium* and *Penicillium*.

*Sample B5—Butter-wash Water.*—The water used for washing the butter was obtained direct from a shallow river, which flowed about 100 yards from the factory. This water was drawn through a pipe by the aid of the factory machinery, and delivered into holding tanks. The sample for plating was collected into a sterile tube direct from the tap in the churn room. From the plates it was found that 1 c.c. of water contained 22,800 micro-organisms; 8,800 of these were proteolytic types, being able to liquefy

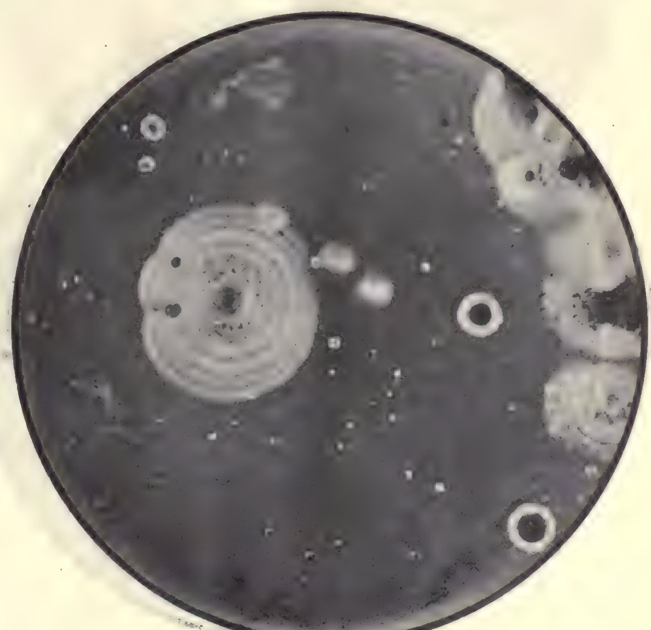
B1



**Glucose Agar Plate Culture of Cream before pasteurising (dilution, 1 to 1,000).**

Note great latent infection. The colonies developed represent 108,355,000 micro-organisms per c.c., largely coliform types. (Original.)

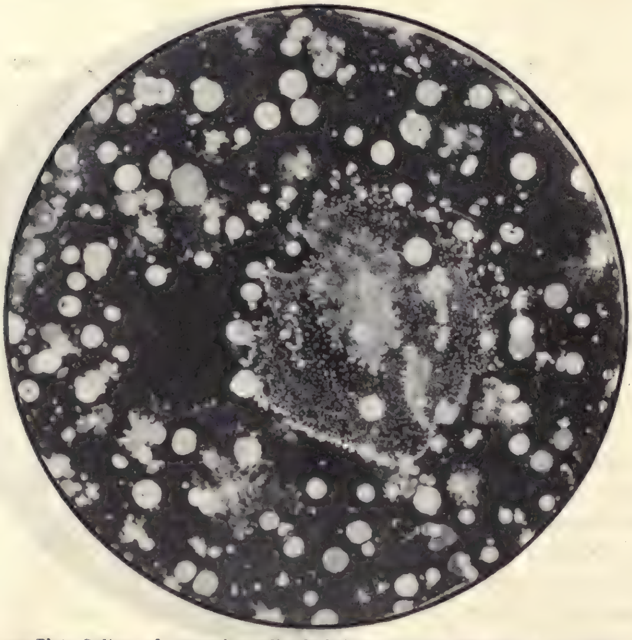
B2



**Agar Plate Culture of Cream after pasteurising by flash system, at 182 deg. Fah. (dilution, 1 to 100.)**

Note the effect of pasteurisation. Number of organisms reduced from 108,355,000 micro-organisms to 14,480. (Original.)

B3

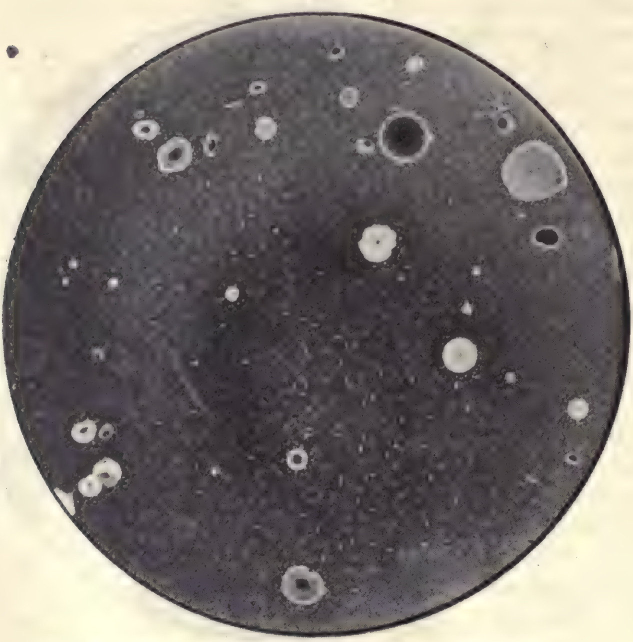


**Agar Plate Culture of Cream immediately before churning (dilution, 1 to 1,000).**
**Held in vats overnight at 57 deg. Fah.**

Note the great amount of re-infection that has taken place, largely through a selected unpasteurised can of cream being used as a starter.

(Original.)

B4

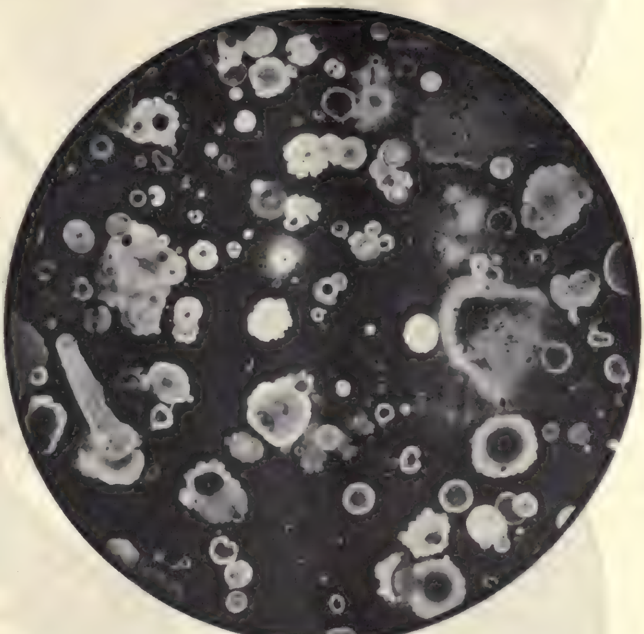


**Agar Plate Culture of butter from surface of box after packing (dilution, 1 to 1,000).**

Note many of the organisms shown in B3 have been eliminated through draining off the buttermilk and wash waters. (Original.)

33(

B5



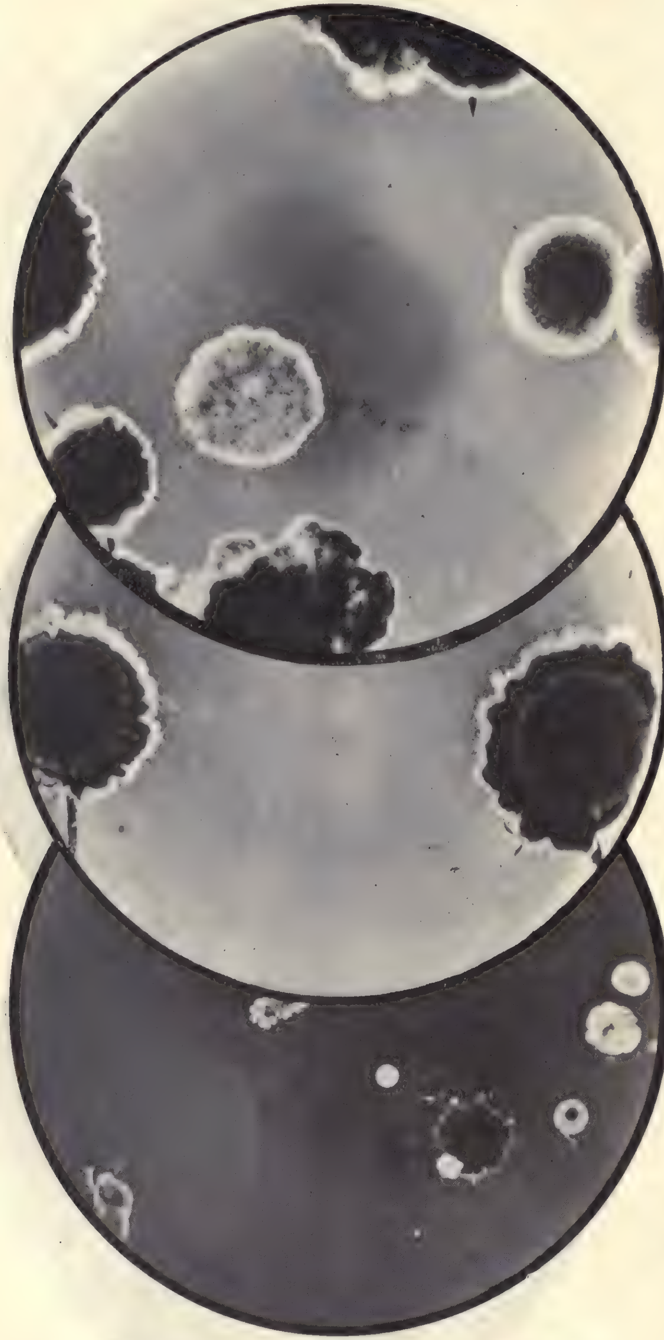
**Agar Plate Culture of water used for washing butter, pumped direct from river (dilution, 1 to 1,000.)**

Note the enormous number of moulds, bacteria, &c. (Original.)

B6

B7

B8



**Plates exposed to atmosphere inside factory for two and a-half minutes, showing growth of colonies of moulds and bacteria.**

**B6**—Acid Agar Plate—Cream Attemperator Room.

**B7**—Acid Agar Plate—Churning Room.

**B8**—Ordinary Agar Plate—Cold Room at chilling temperature.

(Original.)

gelatin or digest the casein of milk. They included *Bact. fluorescens liquefaciens*, *Micrococcus flavus*, *Staphlococcus aureus*, *Bact. cloacæ*, a gram positive bacillus and a sporing bacillus. The most conclusive proof that the water was heavily contaminated with the organisms of fæcal origin was the presence of 6,400 per c.c. of *Bact. coli.* Three varieties were recognised, viz., *Bact. coli communis*, *Bact. lactis ærogenes*, and *Bact. cloacæ*, all of which can cause gassy fermentation of lactose, while *Bact. cloacæ* is also able to liquefy gelatin. There were 5,200 acid and acid-coagulating organisms, including 2,000 streptococci and 3,200 micrococci, while 1,400 other bacteria caused alkalinity or no apparent change. The 1,000 moulds were species of *Aspergillus*, *Fusarium*, and *Mucor*.

### Results of Atmospherically Exposed Plates.

Sterile media in the form of a jelly were melted, and carefully poured into sterile petri dishes, and allowed to solidify. These dishes were carried to the respective rooms of the factory, where the lids were carefully removed, and the media exposed for 2½ minutes to allow the free access of micro-organisms. The media used were ordinary agar, litmus lactose agar, and an acid agar specially suitable for the development of moulds.

*Plate B*6.—An acid agar plate was exposed 2½ minutes to the atmosphere of the cream attemperator room; it showed the development of nine mould growths, including species of *Penicillium*, *Alternaria* and *Aspergillus*.

*Plate B*7.—An acid agar plate exposed 2½ minutes to the atmosphere in the churning room showed the development of two colonies of *Penicillium* sp.

*Plate B*8.—An ordinary agar plate was exposed 2½ minutes to the atmosphere in the cold store room. The total micro-organisms developed were twenty-one; of these, one colony was the mould *Cladosporium* sp., while the remainder were chromogenic bacteria.

(*To be continued.*)

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## Table Grape Varieties for Wagga District.

Intending to plant about 4 acres with table grapes, a Coolamon orchardist wished to know the best varieties for his purpose, and whether the locality necessitated the use of resistant stock.

The Viticultural Expert replied that resistant stocks were not necessary. Cuttings of Black Cornichon, Waltham Cross, Doradillo, and Muscat Gordo Blanco would be best, the first two to be trellised and the last-named either bushed or trellised. The land on which it was proposed to plant the cuttings should be subsoiled beforehand, and the cuttings should be planted in rows 10 feet apart, with an allowance of 8 feet between each cutting. If trellised, a bottom wire should be placed at 2 feet from the ground and a second one 18 inches above this for the shoots to cling to. Cuttings should be 12 to 15 inches in length, and cut close below a bud at the base and above a bud at the top. A good plan was to mound the cuttings over to protect them until they had burst and were growing.—H. E. Laffer.

## MACHINE *v.* HAND MILKING.

THE Dairy Husbandry section of the Michigan Experiment Station, in the course of extensive studies in the cost of milk production, has secured data regarding the time occupied in hand milking as against machine milking. Records were kept of ninety-three herds, in forty-two of which hand milking was practised and in fifty-one machine milking. The facts can be best presented thus:—

| | Hand Milking. | Machine Milking. |
|---|---|---|
| Hours milking per cow, per year ... ... ... | 89·25 hours. | 57·91 hours. |
| Care of milk and utensils per cow, per year... ... | 11·19 ,, | 13·37 ,, |
| Total time per cow, per year ... ... ... ... | 100·44 ,, | 71·28 ,, |
| Hours milking per 100 lb. milk ... ... ... | 1·26 ,, | 0·91 ,, |
| Care of milk and utensils, per 100 lb. milk ... ... | 0·16 ,, | 0·21 ,, |
| Total time per 100 lb. milk ... ... ... ... | 1·42 ,, | 1·12 ,, |

Comparing large herds with small, it was found that the time saved was appreciably greater with the larger herds. The time spent in drawing and caring for 100 lb. milk with machine milking, in herds of fifteen cows or less, was 1·21 hours, but in herds of over fifteen cows, it was only 1·09 hours.

## TREATMENT FOR WORMS IN HORSES.

THE following treatment for worms in horses is recommended by the Chief Inspector of Stock. Put the horse on bran mashes for three or four days, then starve for twelve hours, and afterwards drench with 2 oz. of turpentine well shaken up in a pint of raw linseed oil. The drench should be given slowly by the mouth, care being taken not to tie the animal's head up, and to let it down at once in the event of coughing.

## THE EUROPEAN CORN BORER.

SOME months ago much interest attached to the alarmingly rapid spread of the European corn borer in portions of the United States and Canada, and to the warnings issued about the possibility of its appearance here. Recent advices of the Washington Department of Agriculture show that its attacks have been confined to a limited area in the Boston district and the injury there has been small. As with many insect invasions that at first look most threatening, this borer largely confined its operations to a specific class of feed (sweet corn and dwarf flint varieties), and climate acted as a distinct control in limiting the number of broods in cool districts to one in the season.

It was observed that the worst infested fields were usually either poorly tilled and weedy or surrounded by neglected areas, and there were notable examples of well-tilled fields even of sweet corn with clean surroundings in which injury was negligible—so that there is a possibility of cultural control.

An important natural enemy has developed in the form of a small parasitic fly that destroyed fully 43 per cent. of the eggs of the second generation in the Massachusetts area of infestation; in places the parasitism reached 75 per cent. of the eggs.

# Safeguarding Farm Stock from Disease.

## (1) By Preventing the Introduction of Infection.

MAX HENRY, M.R.C.V.S., B.V.Sc.

The control of infectious disease is, in all countries, becoming more and more a matter of careful study and strict supervision on the part of those entrusted with the work by the State. In every civilised community there is now a veterinary service, the main duty of the officers of which is to endeavour to prevent the introduction of infectious diseases of animals into the country, to control them if they have already gained entrance, and to eradicate them if possible.

The machinery devised for this work varies in different countries. In Europe, before the war, such countries as Germany, France, Belgium, and all the progressive nations had highly-developed veterinary services for this work, and presumably now that peace is restored, these services will be resuscitated and improved. The need for such resuscitation is obviously the more urgent when it is remembered that the war (like the Boer war in South Africa) has left its inevitable aftermath of disease in animals—in this case from one end of Europe to the other.

Apart from European nations, the finest veterinary State service exists in the United States of America, and is known as the Bureau of Animal Industry. This bureau controls everything connected with the health and disease of stock, and employs over 1,000 veterinary officers. Canada and New Zealand are also developing very fine services. On turning to New South Wales, we find, as in so many things, that the State is behind the times; that the legislation regarding stock disease is obsolete, control is divided between several departments, and is therefore inefficient, and the necessary institutions for the proper study of disease are not yet complete. However, control is not entirely lacking. The introduction of infectious disease from other countries is watched by the veterinary officers of the Department of Agriculture working under the authority of the Federal Quarantine Act. The Stock Branch of the Department of Agriculture is entrusted with the control of certain scheduled diseases wherever found, and the Board of Health is concerned with certain diseases of dairy cattle. There will be no really generally efficient work in Australia, however, until there is established a Federal department like the veterinary departments of the United States of America, Canada, or New Zealand, dealing with all aspects of animal disease. At present the energy of one State is liable to be nullified by the apathy of its neighbours.

Good examples of the absolute protection of a country from certain diseases are seen in the freedom of Australia from rabies, glanders, foot and

mouth disease and many other highly infectious diseases. Instances of successful control may be observed in the suppression of glanders amongst the horses of the British armies, the reduction in the mortality from anthrax in New South Wales, and the control of rinderpest in India and Africa. Nor is eradication of many diseases impossible, as England showed in dealing with contagious pleuro-pneumonia in cattle, and Australia with scab in sheep. Still, no matter how efficient the State service may be, it is not always possible to prevent disease being spread from farm to farm, and herein the co-operation of the farmers themselves is most necessary. To this end it is very desirable that a knowledge of what constitutes infectious disease, and what diseases they are likely to meet with, should be widespread among stock-owners, and that they should realise how much the prevention of the spread of these complaints lies in their own hands.

Infectious diseases are due to micro-organisms of various kinds, and when these gain entrance into the body and multiply in the organs, tissues, or cavities, and produce disease, an infection is said to occur, and the disease so produced is called an infectious one. Many such diseases occur in Australia though fortunately the country has remained free from a number of the most serious, the reasons being the long voyage from most of the stock exporting countries in the old days, and the strict quarantine regulations in later days. Yet in one way or another various infectious diseases have been introduced, and the list is now a fairly extensive one. In all animals anthrax and tetanus may occur; in horses, strangles and influenza; in cattle, tuberculosis, actinomycosis, pleuro-pneumonia contagiosa, blackleg, contagious abortion, contagious mammitis, tick fever, and hæmorrhagic septicæmia; in sheep, caseous lymphadenitis; in pigs, tuberculosis, swine fever, and swine plague; and in fowls coccidiosis and spirochætosis. It is not suggested that this list includes all that may be present or may be found, but those mentioned are the most important.

### Methods by which Infection may Occur.

It will be obvious that measures which may prevent the spread of some of the above will be useless against others, but at the same time certain general principles can be laid down which will be of value in almost all cases. Before considering such measures it is necessary to enumerate the methods by which infection of a farmer's stock may occur. These may be set down as follows:—

1. By the introduction of diseased stock on to a farm.
2. By the introduction of infectious material on the clothing, boots, &c., of stock attendants or other persons coming from infected farms.
3. By the introduction of contaminated matter by uncontrolled agencies such as birds, dogs, &c.
4. By the contraction of disease by healthy animals whilst temporarily away from the farm.
5. By taking healthy stock on to an infected farm.

### By the Introduction of Diseased Stock

First, and most important of all, comes the introduction of diseased stock on to a farm. It might be thought that this could easily be prevented, but such is not the case. Every infectious disease has what is known as a period of incubation—that is to say, a more or less definite time elapses in each disease from the entry of the organism into the body till the appearance of the first symptoms indicating that the animal is diseased—and it may happen that stock are purchased and moved on to a farm in that period. Again, there are in many diseases acute and chronic forms, and animals affected chronically may often show very little sign of disease, especially if the conditions under which they are living are good as regards feed and general hygiene; later, when adverse conditions occur, the disease may again become active. In one or two diseases the existence of "carriers" (that is, animals which are affected and infectious to others but which at no time show signs of disease) is more than probable. Further, it is not usual for the farmer to know sufficient of these diseased conditions to be able to say that animals are affected or not, and owing, therefore, to one factor or another a diseased animal slips in. In passing, it may be mentioned that such animals are more often obtained through buying in open saleyards than when purchasing direct from the owner or breeder. The complaints which are more particularly introduced in the manner now under consideration are tuberculosis, contagious abortion, contagious mammitis, swine fever, and swine plague. The first three are chronic diseases, although acute cases of contagious mammitis, terminating rapidly in death or serious incapacity, are not uncommon; the last two are usually introduced in the incubative stage, but chronic cases may also occur. An animal in the early stages of actinomycosis might also escape notice, and it is of course possible for an animal in the incubative stages of any of the diseases mentioned to be purchased, though in some (such as anthrax and blackleg) it is very unlikely.

When purchasing horses, particularly young animals, strangles may very readily be introduced; in fact, if anything like large numbers of young animals are bought and kept together it is very probable that strangles will appear sooner or later. So much is this the case that various methods of vaccination have been used in remount camps and other collecting places, but with no striking measure of success. The farmer buying one or two animals only, however, does not run such risks, especially if he is buying animals over 5 years old. Influenza is still less likely to be introduced; in any case, the lapse of a week or little more without the animal showing signs of illness will generally mean that the owner is safe with regard to these diseases. From this it will be seen that if newly-purchased horses are kept apart for a fortnight from those already on the farm, they can then be placed with the others without much fear of ill results, providing they are still in good health.

Thus it is evident that in this country the introduction of infectious diseases on to a farm by horses is relatively small, but when we come to consider the same question in regard to cattle, a very different state of affairs

will be found to exist. Only one disease can be so easily guarded against as strangles and influenza, and that is pleuro-pneumonia contagiosa. An isolation period of thirty days would in most cases warrant one in taking it for granted that the cattle were free, unless there was amongst them some beast with a chronic lesion in the lung, and in such a case it would not be possible to say at what period (if ever) the animal could be considered safe. Care in selecting the district in which cattle are purchased goes a long way to safeguard a farmer, and, again, if the animals are purchased direct from the farm there is less likelihood of infection. Such acute diseases can usually be guarded against with success, but the chronic ones—such as tuberculosis—present a more difficult problem.

It may safely be said that no ordinary inspection, without resort to tests, can prevent the introduction of tuberculosis into a herd. Nevertheless, if it is carried out by trained men it may do something to reduce the number of tubercular animals introduced, and if the tuberculin test be applied by men skilled in its use, a herd could be kept free from the disease. The expense involved in testing, and the difficulty in country districts of procuring the services of men capable of properly carrying it out, will generally act as deterrents to its application.

In dealing with tuberculosis, it is not of great value to keep newly introduced cattle in isolation, because in many instances an animal may be affected for a very long period without showing any outward symptom. The intending purchaser should have as efficient an inspection made as it is possible to get, should buy from farms with a reputation for health (and in most districts it is possible to get some idea of the reputation of breeders from this point of view), and at the first sign of suspicions of tuberculosis should get a veterinarian to inspect. It must be borne in mind that a tubercular animal may at any time become infectious, and that it is then dangerous to other cattle and pigs, and, if a milking cow, to human beings as well, and particularly to the young of all three.

Much the same may be said with regard to actinomycosis so far as prevention goes, but of course the danger and infectivity are far less, and so long as there are no open discharging areas the disease is not of much importance.

Both contagious mammitis and contagious abortion (especially the latter) are common in the State, and the isolation of newly-purchased cows is strongly recommended in respect of these diseases. In so far as mammitis is concerned the isolation need only be for a few days, until it can be noted that the udder and milk supply are normal. This must involve, in the case of milking cows, careful manual examination of the udder and a visual examination of the milk. Cows with irregularities in the udder should be looked upon with great suspicion, as such irregularities might be due to tuberculosis, actinomycosis, or one of the various forms of contagious mammitis, and no cow so affected should be permitted with the herd. Contagious abortion will require more care, and it would be just as well, if

possible, that cows bought in calf, unless from a known clean herd, should be kept apart until they calve. This is generally impracticable except possibly in the case of heifers carrying their first calf. Unfortunately, old cows which have aborted many times may carry a calf full time and yet be affected. This disease is a notoriously difficult one to keep out, yet something may be done to diminish the risk by isolation for a few weeks, as among other things time will be given to note whether there is any sign of vaginal discharge, whether the animals frequently return to the bull or show other signs of the disease. Purchase of cows through the saleyard is one of the commonest methods of introducing the disease.

While tick fever does not exist in this State, though prevalent in Queensland, it is mentioned to illustrate the preventive methods which have to be adopted under varying circumstances. A farmer in country which is infected with both ticks and tick fever must have his cattle infected with tick fever or he will lose them, and if they do not contract it naturally it must be given them artificially by inoculation; but a farmer in a country tick infested but without tick fever (as in our North Coast districts) must on no account bring a tick fever animal into his herd, though a man in country free from tick and tick fever may bring tick fever infected cattle into his herd without fear.

Microbial disease of importance is not likely to be introduced by bringing fresh sheep into a flock, although the parasitic infestations of sheep are very important; they do not, however, concern us in this paper. Caseous lymphadenitis, the one disease peculiar to sheep previously mentioned, is not likely to be detected in the majority of cases by inspection, although a few cases may be noticed, especially in shorn sheep. In any case it does not appear to be of great importance and is not markedly infective.

It is in dealing with pigs that the greatest value of inspection and isolation is seen, particularly in connection with the two very serious diseases—swine fever and swine plague; the preventive measures which the farmer puts into force against the one will act against both. It should be the rule with every pig farmer and fattener that no pigs shall, on being first brought on to the farm, be placed in contact with the pigs already there. This isolation should be strict and kept up for three weeks. Care should be taken to buy from healthy localities if possible, and to attain the maximum of safety the farmer should aim at breeding all his own pigs. The danger of introducing the disease does not lie so much with the well-bred stud pigs from breeders of repute as with the store pig bought from the dealer. It is not likely that tuberculosis in the pig will be detected during life, but the farmer will very soon find whether tuberculosis is present in his pigs or not if he sends any for slaughter, and, on the first sign, should take prompt measures to stamp it out.

Coccidiosis is probably the most serious disease likely to be introduced by fowls, and the directions of Dr. Dodd, Consulting Veterinary Pathologist to the Department, may be quoted. The purchaser is advised to make sure

that his birds come from a healthy establishment, and, in the case of young chicks, that there has been no recent high mortality on the place from which they came. Since the eggs may act as carriers they should be washed with alcohol and dried in the air before placing in the incubator. No second-hand baskets, crates, or incubators should be brought on to a farm without careful disinfection.

(*To be continued.*)

## Telephone Cables Damaged by Wood Borers.

Temporary suspension of the telephone service in the Chatswood district recently was traced by the Postmaster-General's Department to two small holes bored in the lead cable, water being thereby admitted. On cutting the lead away a small beetle—which had also bored through the lead bands attaching the cable to the pole and riddled the wood—was discovered. In the pole were also found four larvæ.

As the Department's cables had frequently been similarly attacked, the specimens found were forwarded to the Government Entomologist, who reported that the beetle (*Bostrychus cylindricus*) was one of our common native wood-boring beetles; it attacked all kinds of timbers, but the larvæ usually fed and pupated in the sapwood. This beetle was recorded some years ago damaging empty wine casks at a place near Glenfield. The boring through lead seemed to be a casual habit, and no practical method of dealing with it presented itself except to destroy any poles, &c., in which the larvæ were found to be breeding in any number.

Readers of the *Gazette* will remember that in November, 1917, the Government Entomologist, Mr. W. W. Froggatt, had a note on another beetle (*Xylothrips gibbicollis*) which had similarly attacked and perforated sections of telephone cable in a number of cases in the metropolitan area.

## Silage from Beet-tops.

The cultivation of beet sugar in the United States has lately been suggestive there of a wider usefulness for the crop, namely, the utility of the tops for the purpose of silage, and the U.S. Department of Agriculture indicates that growers in certain of the States who have a sufficient quantity of these tops might reduce their hay requirements by half.

The essentials involved in making good beet-top silage are said to be substantially similar to those governing the making of good maize silage, the same types of silo (structure or pit) being also applicable. Fermentation in the silo (says the "Weekly News Letter," U.S. Department of Agriculture) corrects the cathartic salts in the beet-tops and crowns, and the best feeding practices show that the beet-top silage reduces hay requirements one-half in feeding for beef or mutton or milk production. The silage should be fed lightly to stock at first, and the stock-owner should be particularly wary of mouldy portions.

# The Scottish Milk Records Association.

L. T. MACINNES, Dairy Expert.

THE records of the above Association show that interesting work has been proceeding for some years in Scotland in the way of herd-testing, and a few particulars should be of interest to dairy farmers in New South Wales.

The movement was inaugurated in 1903 with only one testing unit, in which were twelve herds comprising 389 cows. From that time steady expansion took place until the Association was formed with a new constitution on 28th February, 1914, in accordance with a scheme approved by the Board of Agriculture for Scotland and the Development Commissioners, an annual grant of not more than £2,000 being obtained from the Government to aid in carrying out and expanding the work and in keeping records in a proper and business-like manner.

In the year 1914, 26,424 cows from 641 herds were tested, while in 1915, notwithstanding the outbreak of war, 26,572 cows were entered under thirty-five separate units, each with its trained tester.

The Scottish Society had the same experience as the New South Wales and other kindred bodies, in that the testers in nearly every instance were at the front. In the case of Scotland, their places were filled where possible by qualified young women, but the dislocation caused by the war also brought about a scarcity of labour and of cattle foods, and a serious diminution in the supply of artificial manures. Some farmers thought it best to discontinue testing, but the Committee unanimously decided to carry on, and the great majority of the units being in agreement, operations were continued, it being felt that in that way the best means of increasing production were being adopted.

### The Method of Classification.

In Australia we record the yields of tested cows in pounds of milk and butter-fat, giving the average test, and making our comparisons in terms of butter-fat, that being considered the best and simplest basis on which to work. But in Scotland a great deal of milk is sold for city purposes, and a method has been devised by the Association with the object of taking into account both the quantity and the quality of the milk. The method adopted is to reduce all yields to the estimated equivalent of 1 per cent. fat. Thus a cow yielding 833 gallons of milk testing 3 per cent. is regarded as equal to one yielding 714 gallons but testing 3·5 per cent., or a third yielding 625 gallons testing 4 per cent. If the average test is also given, this information will enable both the total quantity and the quality of each cow's milk to be obtained. Unless this is done, the facts as to any particular cow—which for breeding purposes are most important—cannot be arrived at.

It is then immaterial which method of comparison is adopted—gallons of milk for those who think in that way, or pounds of butter for those who prefer to make their comparisons on that basis.

The tested cows are also divided into three groups, cows with a milk record equivalent to not less than 2,500 gallons at 1 per cent. fat and heifers with a milk record equivalent to not less than 2,000 gallons at 1 per cent. fat forming Group I; cows yielding less than 1,600 gallons and heifers less than 1,300 gallons milk forming Group III; and all between those two quantities forming Group II. The following table shows the corresponding values of these yields in milk, taking the different standards of quality:—

YIELD in Milk.

| Estimated on 1 per cent. fat basis. | Corresponding gallons when testing. Butter-fat. | | | |
|---|---|---|---|---|
| | 3 per cent. | 3·5 per cent. | 4 per cent. | 5 per cent. |
| Group I. Cows not less than 2.500 gallons | 833 | 714 | 625 | 500 |
| Heifers ,, ,, ,, 2,000 gallons | 666 | 571 | 500 | 400 |
| Group II. Cows from 1,660 to 2,499 gallons | 553-833 | 474–714 | 415-625 | 332–500 |
| Heifers ,, 1,330 to 1,999 gallons | 443-666 | 380-570 | 332½-500 | 266-400 |
| Group III. Cows less than 1,660 gallons | 553 | 474 | 415 | 332 |
| Heifers ,, ,, 1,330 gallons | 443 | 380 | 332½ | 266 |

Records of the Scottish Association later than 1915 are not available, but those before us show that whereas in 1914, 39½ per cent. of the cows tested came into Group I, in 1915, 46 per cent. reached that standard. Considering the disabilities under which dairy farming was carried on during that time, through lack of all kinds of food for stock, this was a creditable performance, and shows that the average yields of the herds were increased by testing. This improvement is also exemplified in the cases of several particular herds. The following little table is well worth the attention of herd owners here:—

| Year. | No. 1 Herd. | | No. 2 Herd. | | No. 3 Herd. | |
|---|---|---|---|---|---|---|
| | No. of cows tested. | Percentage in Group I. | No. of cows tested. | Percentage in Group I. | No. of cows tested. | Percentage in Group I. |
| 1910 | 46 | 39 | 48 | 40 | 43 | 49 |
| 1911 | 42 | 64 | 52 | 56 | 39 | 54 |
| 1912 | 50 | 58 | 55 | 55 | 44 | 61 |
| 1913 | 52 | 77 | 56 | 79 | 38 | 89 |
| 1914 | 48 | 88 | 60 | 83 | 43 | 93 |
| 1915 | 53 | 80 | 53 | 82 | 39 | 97 |

In each case there has been a marked improvement in the standard of the cows kept, an invariable concomitant of testing, it may be said. In No. 1 herd, for instance, the percentage good enough to come into Group I advanced from 39 in 1910 to 64 in 1911, and reached 88

in 1914. In No. 2 herd the most striking improvement was from 55 per cent. in 1912 to 79 per cent. in 1913, while No. 3 herd also showed a remarkable advance from 1912 to 1913.

The records show that in some cases where the average milk yields showed no increase it was ascertained on inquiry that the cause was persistence in the use of a bull of poor production strain, so that while the lowest producers were being culled out they were being replaced with home-bred heifers whose yields were no better or were even worse than those being disposed of. In other instances farmers ceased testing because they had farms of poor soil, and thought their herd records would not compare favourably with others obtained from higher class farms, quite forgetting that in herd testing and the building up of a high producing herd of cows each farm makes its own individual standard of comparison, and that, on poor lands as well as on the rich, there will always be found stock of differing quality. Even on the poorer soils it has been possible to show greatly increased average returns. In New South Wales, we have had similar instances where farmers have used these excuses to cease or to decline to take up testing, and we have also many cases where by the introduction of the testing system the yields have been materially increased in a few years.

### Testing for the Milk Supplier.

Some months ago an effort was made to initiate the herd-testing movement in certain New South Wales districts where dairying is carried on mainly for the purpose of supplying milk for consumption in the city (Sydney), or for selling to cheese or condensed milk factories. The proposals laid before these dairymen were turned down as of no material benefit to them, inasmuch as it did not, in their view, matter if cows produced 200 lb., 300 lb., or 400 lb. butter-fat, as long as their milk exceeded the minimum fat percentage (3.2 per cent.) laid down by the Board of Health as the standard for milk to be used for human consumption. It would appear that Scottish farmers take a different view, for testing societies were operating in a number of districts in Scotland where milk was produced almost solely for direct sale for human consumption, and on the majority of these farms cows were calving at all periods of the year. Particulars of thirteen of these testing societies show that 8,546 cows and heifers were tested in 1915; of these, 50·5 per cent., or 4,320, were classified in Group 1, as compared with an average percentage of 46 for all cows tested during the same period. Only in a couple of isolated cases, where farmers did not breed or rear their own stock, was testing not availed of. One of these societies was then in its ninth year, two had been in operation eight years, one seven years, and four had five years' records to show.

That which these canny Scots have found to pay them over such a number of years is surely worthy of a trial for one year by New South Wales dairy farmers similarly placed, *who also should aim for increased milk yields.*

## The Useful Turnip Crop.

The turnip crop occupies a unique position in that for its proper growth it postulates a very high standard of farming. Demanding, as it does, the adoption of a systematic rotation, the thorough cleaning of the soil, and a well thought out scheme of manuring, this crop at the very least implies clean land in high condition. Furthermore, the benefits of the utilisation of the turnip crop as a bulky, succulent and valuable winter food are reflected in many ways. By its use the Scottish farmer has not merely triumphed over the long hard winter of the north, but has won world-wide renown as a breeder and feeder of stock. Economically he can employ his labour to the best advantage, since wherever turnips are grown labour is, in general, equally distributed all the year round. Last, but not least, the turnip crop provides the farmer with a ready means of producing a large amount of dung, thus keeping up the fertility of the farm.—J. A. Symon, in the *Scottish Journal of Agriculture.*

## A Swarm of Bees Chooses an Odd Home.

While clipping one of the ornamental hedges at the Farm Home for Boys, Mittagong, Mr. W. P. Wynn discovered a bees' nest of an uncommon type. In an angle formed by the upright and the top rail of the fence which supports the hedge, he found a swarm of bees busily constructing the comb. In the accompanying illustration will be observed four sections of comb depending from the top rail.

The fence had a south-easterly aspect, and was quite exposed to the weather. Evidently the outside comb was designed to act as a protecting wall, as the bees were not then working on it.

## Some Properties of Castor Oil.

Castor oil seed, the local market for which seems to be focussed on a Melbourne proprietary company, is worth about £20 per ton landed. The seed and ground meal are said to be poisonous or harmful to stock, and, though it is stated that poultry are immune from any deleterious effects, the Poultry Expert does not advise feeding castor oil seeds to poultry—certainly not before the oil is extracted.

The beans contain from 50 to 60 per cent. oil. It has been found to be the only satisfactory lubricant for aeroplane engines, standing extremes of heat and cold as no other oil will. The Railway Department also uses such a preparation to some extent for lubrication.

# Notes on Some Cases of Paralysis in Bees.

W. A. GOODACRE, Senior Apiary Inspector.

WHILE a good deal of investigation has been carried out by scientists in different parts of the world in connection with paralysis in bees, and notwithstanding that a quantity of valuable information concerning it has been gathered, the exciting cause and the successful treatment of the trouble are still somewhat obscure. Confusion is also caused in New South Wales by the use of several different names, as for instance, "paralysis," "Isle of Wight disease," and "dwindling." As far as the name "Isle of Wight" is concerned, it can be ruled out for New South Wales, and the name paralysis adopted, for even in England, where Isle of Wight disease has caused such loss in bees, it appears as a form of paralysis which affects the colonies during the winter months or during weather that allows only a poor chance for the colony to recover. I do not think that any form of paralysis in New South Wales originated from the Isle of Wight. In this State the disease affects the colonies during the active part of the season and appears in two noticeable forms. The signs pointing to what may be termed a genuine case of bee paralysis are:—(1) Bees dead and dying about the entrance to the hive; (2) bees partially paralysed and with abdomen distended; (3) bees with a trembling movement and with wings spread out; (4) bees with a greasy and shiny appearance.

### A Milder Form of Paralysis.

The other form of paralysis occurs in a milder form and is more prevalent. Indications of its presence are:—(1) Bees dead and dying about the entrance; (2) bees partially paralysed and with abdomen somewhat distended; (3) bees with wings appearing as if damp with nectar. In the milder form of paralysis the reader will note the absence of the outspread wings and of the trembling.

In genuine paralysis, experiments give ample proof that a good deal of the fault lies in the breeding of the bees of the affected colonies; the weakness may come from the queen or the drone. The milder form of paralysis is usually brought about by digestive troubles, some peculiarity of a season or practically any condition that lowers the vitality of bees having a tendency in that direction. Sometimes the apiarist is at a loss to know what condition has lowered the vitality sufficiently to admit the disease. In most cases of this form of paralysis a number of colonies will be affected at one time, and when favourable stimulating conditions come about the disease will usually disappear without treatment. Not so, however, with the genuine case (where the outspread wings and trembling are evident), for it is rarely found that better conditions will restore the bees to normal health when the fault lies with the breeding.

### Genuine Paralysis Probably Hereditary.

I have endeavoured by investigation to prove that in a genuine case of paralysis the disease is chiefly the fault of the breeding, either from the queen or the drone side, the progeny not being immune from an infection probably originally caused by the parasite *Nosema apis*. Having found a severe genuine case, I tried to improve the bees' condition by the several methods advocated, namely, raising the hive from the bottom board, sprinkling sulphur, and stimulating the colony. At the end of a fortnight's treatment there was no noticeable improvement in the condition of the affected colony. Then, in company with Mr. E. Abnett, an apiarist at Trunkey Creek, I removed the queen from the affected colony and introduced her to a healthy, populous colony one and a-half miles distant. To the affected colony a queen from healthy Italian stock was introduced. I also took a frame of brood and bees from the affected colony and placed it with healthy stock to see if the disease would be likely to be spread in this manner. In six weeks the colony to which the queen from the affected stock was introduced showed severe symptoms of paralysis. The colony which was first affected, and to which the queen from healthy stock had been introduced, showed marked signs of an early recovery—a recovery ultimately completed. The brood and bees from affected stock placed with the healthy colony did not produce the disease.

For further proof of the source of the disease, a similar experiment was tried by again removing the queen from the now affected colony and introducing her to a nucleus. The queen was placed by herself, this time in a disinfected cage, but the result was similar, and the nucleus colony became affected when the progeny of the queen appeared. It is therefore evident that the progeny of such a queen shows no resistance to the disease, and that the introduction of a queen from healthy resistant stock will effect a cure. The experiment proves, too, that the introduction of the disease to other colonies is not likely to be caused by interchanging combs (though I consider that it would be bad practice to interchange brood in such a case).

Regarding the cases of the mild form of the disease, holding the view that the cause of the trouble was a lowered vitality due to something in the food or a poor and stagnant supply of water, I first saw that a good supply of fresh water was made available, and stimulated the colonies daily with warm sugar syrup feed inside the hive. The colonies so treated recovered at an earlier date than those left untreated, but I consider that in such a case it would be a wise precaution if the colonies so affected were marked, and queens introduced from stocks that show resistance.

### Another Obscure Malady.

There is yet another malady that affects bees in some localities for a short period, though it cannot at present be classed as having serious results so far as colony losses are concerned, and the symptoms usually disappear within a short period. I have not seen any writer comment on the malady. The symptoms are peculiar, and somewhat resemble paralysis. The bees appear to lose their equilibrium, and although most of the affected bees can fly a

short distance, they are just as likely to fall on their backs or heads as on their feet. The chief characteristic of the trouble is that the tongue is protruded to its utmost limit, and the bee is continually endeavouring to get it out further, generally appearing by its actions to be in great pain.

No organism can be found that is likely to cause the trouble, and at the present time there is very little known of the cause or of an effective treatment.

In the investigations mentioned and in the writing up of these few notes, I do not claim to have discovered a great deal concerning these obscure diseases, but the knowledge gained from the experiments should be of value to the practical apiarist. I might add, too, that no test or experiment for disease is carried out in the vicinity of the bees at the Government Apiary.

## The Standard of Production in Denmark.

The Dane, while recognising the importance of the various points indicating milking qualities, requires more exact knowledge as to the milking capacity of the cows. The Original Control Society, as they are called, was established in 1895 at Vejen, Jutland. When the first report of the operations of the society was made available by Mr. Jens Johansen, it startled the whole dairying community. The report stated, *inter alia*, that whilst with the best cow it cost 6d. to produce 1 lb. of butter, in the case of the poorest it cost 2s. 8d. An example was given of two cows that stood side by side in the shed, both getting exactly the same feed, care and attention. No. 1 gave 7,810 lb. of milk, with a butter-fat test of 4·26, equalling 385 lb. of butter ; No. 2 gave 8,226 lb. of milk, with a test of 2·93, producing 280 lb. of butter. Although No. 2 gave 416 lb. more milk, No. 1, with her higher test, yielded 105 lb. more butter. Such a revelation caused the movement to spread, and to-day there are about 700 cow testing associations, with a total of 16,500 members, owning 225,000 cows. Some of the more advanced societies also keep records of the amount of food consumed by each cow.

The following figures show an increase in the average yearly yield of butter-fat per cow between the years 1854 and 1918 :—1854 at 44 lb. ; 1861 at 68 lb. ; 1871 at 96 lb. ; 1898 at 129 lb. ; 1903 at 173 lb. ; 1914 at 215 lb. ; 1918 at 240 lb.—R. T. McKenzie in "Agriculture in Denmark" in the Victorian *Journal of Agriculture*.

## Orchardists Pay Heavy Toll to Starlings.

A number of starlings were recently shot at Bathurst Experiment Farm orchard and the contents of their stomachs examined. These showed both grass seeds and apple flesh, the latter predominating. There is no doubt that these birds have caused the destruction of thousands of pounds' worth of fruit in the State this season.—W. J. Allen.

## GREEN FODDER FOR POULTRY ALL THE YEAR ROUND.

"PLEASE advise me as to suitable crops to sow in order to maintain a constant supply of green feed for poultry throughout the year," wrote a Wetherill Park poultry farmer recently. The following table was compiled in reply:—

| Crops to Sow. | | Crops to Sow. | |
|---|---|---|---|
| Month. | Crop. | Month. | Crop. |
| January .. | Maize, cowpeas. | July ... | Rye. |
| February ... | Maize, barley, rape, field peas. | August ... | Silver beet. |
| March ... | Maize, barley, field peas. | September | Hungarian millet, maize. |
| April ... | Lucerne, barley, field peas, red clover, Bokhara or sweet clover. | October . | Cowpeas, maize, Hungarian millet. |
| | | November | Cowpeas, maize, Hungarian millet. |
| May ... | Rye, lucerne and clovers. | | |
| June ... | Rye. | December | Cowpeas, maize. |

Crops sown according to the above table would provide fodder for poultry in the following months :—

| Month. | Feed Available. | Month. | Feed Available. |
|---|---|---|---|
| January ... | Lucerne, cowpeas, maize, Silver beet. | July ... | Barley, rape, field peas. |
| | | August ... | Barley, rape, field peas, rye. |
| February ... | Lucerne, cowpeas, maize, Silver beet. | September | Clovers, field peas, rye, rape. |
| | | October ... | Lucerne and clovers, field peas, Silver beet |
| March ... | Lucerne, cowpeas, maize, Silver beet. | November | Lucerne and clovers, maize, Hungarian millet, Silver beet. |
| April ... | Lucerne and clovers, cowpeas, maize, Silver beet, barley, rape. | December | Lucerne, maize, Hungarian millet, Silver beet and clovers. |
| May ... | Lucerne and clovers, cowpeas, Silver beet, barley, rape. | | |
| June ... | Barley, rape, field peas. | | |

In the case of lucerne, clovers, rye, rape and Silver beet, repeated cuttings may be made; these are allowed for in the table. The availability of these feeds as shown above is to some extent contingent on rainfall or a good water supply. In the case of poor soils, lucerne and clovers will do far better in wide drills; they should be topdressed with animal or poultry manure and kept cultivated between the drills. Sweet clover is a new crop which is worth bringing under the notice of poultry farmers, for it undoubtedly does better in the poor soils of the metropolitan area than does lucerne. It should not be cut too close to the ground, as the new growth comes from the lower parts of the stem, and not from the crown as with lucerne. Nor should it be allowed to go too long without cutting as it becomes coarse.—A. H. E. McDONALD, Chief Inspector of Agriculture.

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"I HAVE received the literature . . . . and wish to thank you for same; it deals with the subject in just the way I desired."—A recent recipient of bulletins and pamphlets.

# Egg-laying Tests at Hawkesbury Agricultural College.

**(Under the Supervision of James Hadlington, Poultry Expert.)**

## EIGHTEENTH YEAR'S RESULTS, 1919–20.

F. H. HARVEY, Organising Secretary.

THE Eighteenth Annual Egg-laying Competition concluded at Hawkesbury Agricultural College on the 31st March, and the record of results is now presented. The competition was controlled by a committee of management, comprising four officers of the Department of Agriculture and three competitors' representatives, namely, Principal H. W. Potts (Hawkesbury Agricultural College), Messrs. James Hadlington (Poultry Expert, Department of Agriculture), C. Lawrence (Poultry Instructor, Hawkesbury Agricultural College), A. E. Brown, W. H. Forsyth and P. C. McDonnell (competitors' representatives), and F. H. Harvey (Department of Agriculture), Organising Secretary.

The committee held four meetings during the year to deal with various matters connected with the competition, including the Annual Poultry Conference, which was held on the 14th June and attended by about 700 poultry farmers.

### Scope of the Competition.

This year's competition was notable inasmuch as the sections for second year's laying, which had been a feature of the competitions for some years, were deleted, and that sections for standard birds were established. To be eligible for entry into the standard sections, it was required that an owner had won a first, second or third prize with the particular breed entered, in an "open show class" at an approved exhibition held in New South Wales during the previous three years. One standard section each was provided for light and heavy breeds, three groups of six birds being entered in the former and seven groups in the latter. The remainder of the competition (the utility sections) comprised thirty groups for light breeds and fifty groups for heavy breeds.

The breeds represented in the different sections were as follow :—

| | Groups. | Birds. | | Groups. | Birds. |
|---|---|---|---|---|---|
| Section A (Light Breeds) :— | | | Section C 1 (Standard Section, Light Breeds) :— | | |
| White Leghorns ... | 28 | 168 | White Leghorns ... | 3 | 18 |
| Brown Leghorns ... | 1 | 6 | Section C 2 (Standard Section, Heavy Breeds) :— | | |
| Anconas ... ... ... | 1 | 6 | Langshans ... ... | 3 | 18 |
| Section B (Heavy Breeds) :— | | | Rhode Island Reds ... | 3 | 18 |
| Black Orpingtons .. | 35 | 210 | Silver Wyandottes ... | 1 | 6 |
| Langshans ... ... | 8 | 48 | | | |
| Silver Wyandottes ... | 4 | 24 | | | |
| Plymouth Rocks ... | 2 | 12 | | | |
| Rhode Island Reds .. | 1 | 6 | Total ... ... | 90 | 540 |

A

**Mr. J. J. Vaughan's group of White Leghorns.**

Greatest number of eggs in Eighteenth Annual Competition (1,138 eggs) in Light Breeds Section.

A—This hen (No. 439) was winner of prize for greatest number of eggs laid by an individual hen in the section (281 eggs).

### Weight of Eggs.

The regulation that individual hens must lay eggs of at least 2 oz. each, and eggs from groups average at least 24 oz. per dozen within six months of the commencement of the competition, in order to be eligible for prizes, resulted in the disqualification of forty-five individual hens and five groups, as follows:—

*Disqualified from Individual Prizes.*

*Light Breeds.*—L. Bulluss (No. 327); H. A. Gradwell (No. 358); J. W. McKendry (No. 333); L. K. Pettit (No. 409); A. H. Jones (No. 428); Willow Grange Poultry Farm (No. 451); N. J. McAppion (No. 494)—all White Leghorns.

*Heavy Breeds.*—F. R. Rooke (No. 4); Mrs. Hopkins (Nos. 25 and 30); A. Chick (Nos. 33 and 36); W. H. Whittorn (Nos. 91 and 93); G. Hopping (Nos. 104 and 108); C. Judson (No. 119); J. King (No. 135); H. S. Lewis (No. 149); B. A. Maher (No. 162); R. P. Manton (No. 168); P. C. McDonnell (No. 175); J. Roberts (No. 185); F. J. Shanley (Nos. 188 and 191); J. Wheller (No. 198); P. G. Heath (No. 205)—all Black Orpingtons; C. E. Banks (No. 216); A. E. Brown (No. 220); H. J. Durrington (No. 230); F. Fuggle (No. 243); A. B. Laverack (No. 248); Paika Poultry Farm (Nos. 254 and 256); D. Rees (Nos. 499 and 504); Standard Poultry Yards (No. 527); W. Hilliard (Nos. 530, 531, and 532)—all Langshans; E. J. Kinney (Nos. 267, 268, and 269); A. J. Nolan (No. 271); O. H. Walton (No. 282)—all Silver Wyandottes.

*Disqualified from Group Prizes.*

*Light Breeds.*—Nil.

*Heavy Breeds.*—A. Chick, Black Orpingtons (Nos. 31 to 36); W. H. Whittorn, Black Orpingtons (Nos. 91 to 96); Paika Poultry Farm, Langshans (Nos. 253 to 258); W. Hilliard, Langshans (Nos. 529 to 534); E. J. Kinney, Silver Wyandottes (Nos. 265 to 270).

### Ration fed to the Competition Birds.

The birds are fed on a simple ration, which is best expressed as follows:—

| The Morning Mash. | | | Evening Ration of Grain. |
|---|---|---|---|
| Pollard ... ... | 60 | per cent. | Two-thirds wheat. |
| Bran ... ... | 20 | ,, | One-third crushed maize. |
| Lucerne dust* .. | 15 | ,, | |
| M.I.B. meat meal.. | 5 | ,, | |
| | 100 | ,, | |

Add 4½ oz. of common salt to each 20 lb. (or bushel) of mash.

The nutritive ratio of the above feed for the day is approximately 1 to 4·5.

*Mixing Mash for Adult Birds.*—The proportion by weight of bran or bran and lucerne dust is added to the meat meal; then there is poured over it sufficient liquid into which has been dissolved a quantity of common salt equal to 4½ oz. for each 20 lb. of food to be mixed. The bran then resembles a wet mash in the form usually given to horses or cattle; the proportion by

* When unobtainable, its equivalent in bran is used.

A

**Five of Mr. A. Drayton's group of Black Orpingtons (sixth dead).**

Greatest number of eggs in Eighteenth Annual Competition (1,428 eggs) in Heavy Breeds Section.

A—This hen (No. 50) was winner of prize for greatest number of eggs laid by an individual hen in the competition (303 eggs).

weight of pollard is then mixed thoroughly into a mass of a consistency that can be balled by the hands under slight pressure, and will fall to pieces when thrown down. Should the pollard be of a coarse description, less bran is used. On the other hand, should it be fine, more bran is used. The nutritive value of both is so nearly identical that, from that point of view, the proportions are immaterial.

As much chaffed green lucerne as the birds will eat is given at midday. The shell grit supplied consists of two-thirds sea-shell to one-third crushed oyster shell. This is, of course, always available to the birds.

## Mortality and Disease.

There are no special features worthy of mention regarding the health of the fowls. The casualties were a few more than in the previous year, forty nine as compared with forty-three, the details being :—

| | 1918–19. | | 1919–20. | |
|---|---|---|---|---|
| | Light Breeds. | Heavy Breeds. | Light Breeds. | Heavy Breeds. |
| Birds replaced ... ... ... | 7 | 6 | 7 | 13 |
| Birds not replaced ... ... | 17 | 13 | 11 | 18 |

## The Monthly Laying.

The following table has been prepared to show the monthly egg yield in the different sections. It will be seen that the heavy breeds attained their highest average (21·3 for 300 hens in section B, and 22·0 for forty-two hens in section C2) in August, while the best results for the light breeds (21·7 for 180 hens in section A, and 20·9 for eighteen hens in section C1) were obtained in October. In the twelve months, 106,420 eggs were laid, equal to 197 eggs per hen, the average of the different sections being :—

Section A ... 203 eggs per hen. Section C1 ... 195·4 eggs per hen.
„ B ... 190·4 „ „ „ C2 ... 191·8 „ „

### THE MONTHLY LAYING.

| Month. | Section A. | | Section B. | | Section C1. | | Section C2. | |
|---|---|---|---|---|---|---|---|---|
| | Total for 180 hens. | Average per hen. | Total for 300 hens. | Average per hen. | Total for 18 hens. | Average per hen. | Total for 42 hens. | Average per hen. |
| April, 1919 ... | 1,652 | 9·2 | 3,062* | 10·4* | 190 | 10·6 | 359 | 8·5 |
| May, „ ... | 2,614 | 14·5 | 4,740 | 15·8 | 253 | 14·1 | 626 | 14·9 |
| June, „ ... | 2,576 | 14·3 | 5,192 | 17·3 | 227 | 12·6 | 702 | 16·7 |
| July, „ ... | 2,966 | 16·5 | 5,774 | 19·2 | 299 | 16·6 | 771 | 18·3 |
| August, „ ... | 3,553 | 19·7 | 6,395 | 21·3 | 334 | 18·6 | 920 | 22·0 |
| September, „ ... | 3,733 | 20·7 | 6,010 | 20·3 | 347 | 19·3 | 861 | 20·5 |
| October, „ ... | 3,905 | 21·7 | 5,448 | 18·1 | 376 | 20·9 | 763 | 18·2 |
| November, „ ... | 3,789 | 21·1 | 4,947 | 16·5 | 363 | 20·1 | 738 | 17·6 |
| December, „ ... | 3,546 | 19·7 | 4,612 | 15·4 | 355 | 19·7 | 671 | 16·0 |
| January, 1920 ... | 3,231 | 17·9 | 4,131 | 13·7 | 321 | 17·8 | 598 | 14·2 |
| February, „ ... | 2,914 | 16·2 | 3,968 | 13·2 | 266 | 14·8 | 544 | 13·0 |
| March, „ ... | 2,156 | 11·9 | 3,933 | 13·1 | 187 | 10·4 | 492 | 11·7 |
| Totals ... | 36,635 | 203·0 | 58,212 | 190·4 | 3,518 | 195·4 | 8,055 | 191·8 |

* Only 294 birds competed in Section B in April, 1919.

### Scores of Leading Birds.

The highest individual record was 303 for Mr. A. Drayton's Black Orpington, No. 50, and Mr. H. J. Durrington's Langshan hen, No. 233, was a close runner up with a score of 302. Mr. W. Hilliard's Langshan, No. 534 (Standard Section), occupied third place with a score of 294. Although in

**Three of Mr. E. T. Rhodes' group of White Leghorns.**

Winner of second prize in Eighteenth Annual Competition (1,436 eggs) in Light Breeds Section.

the general average the light breeds laid better than the heavy breeds, in the individual scores the light breeds did not attain to higher than tenth place (Mr. J. J. Vaughan's White Leghorn, No. 439, laid 281 eggs), the next best score in this section being 280 eggs for Mr. G. A. Baxter's White Leghorn, No. 320.

The following table shows the monthly records of the ten leading birds in light and heavy breeds.

| Owner and Breed. | April. | May. | June. | July. | August. | September. | October. | November. | December. | January. | February. | March. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Light Breeds.* | | | | | | | |
| J. J. Vaughan : White Leghorn .. .. | 19 | 16 | 23 | 26 | 26 | 27 | 25 | 26 | 26 | 26 | 21 | 20 | 281 |
| G. A. Baxter : White Leghorn .. .. | 21 | 21 | 22 | 21 | 21 | 25 | 27 | 26 | 26 | 24 | 24 | 22 | 280 |
| A. Messervy : White Leghorn .. .. .. | 18 | 20 | 20 | 18 | 24 | 23 | 26 | 23 | 24 | 25 | 23 | 21 | 265 |
| J. J. Vaughan : White Leghorn .. .. | 21 | 24 | 21 | 20 | 25 | 21 | 25 | 29 | 25 | 18 | 15 | 21 | 265 |
| E. T. Rhodes : White Leghorn .. .. | 12 | 21 | 19 | 21 | 20 | 22 | 26 | 26 | 25 | 26 | 24 | 22 | 264 |
| N. J. McAppion : White Leghorn .. .. | 14 | 19 | 20 | 22 | 23 | 23 | 26 | 26 | 24 | 23 | 21 | 21 | 262 |
| L. K. Pettit : White Leghorn .. .. | 19 | 22 | 17 | 19 | 20 | 23 | 23 | 25 | 26 | 24 | 21 | 23 | 262 |
| A. Gliddon : White Leghorn .. .. .. | 5 | 23 | 18 | 26 | 24 | 24 | 25 | 25 | 23 | 23 | 25 | 21 | 262 |
| E. T. Rhodes : White Leghorn .. .. | 14 | 22 | 21 | 21 | 23 | 23 | 25 | 24 | 26 | 24 | 21 | 16 | 260 |
| L. K. Pettit : White Leghorn .. .. | 7 | 24 | 22 | 21 | 22 | 19 | 25 | 25 | 26 | 24 | 23 | 20 | 258* |
| J. J. Vaughan : White Leghorn .. .. | 21 | 22 | 19 | 21 | 22 | 22 | 24 | 22 | 24 | 21 | 19 | 21 | 258 |
| | | | | | | *Heavy Breeds.* | | | | | | | |
| A. Drayton : Black Orpington .. .. | 25 | 24 | 24 | 29 | 28 | 28 | 21 | 25 | 25 | 26 | 24 | 24 | 303 |
| H. J. Durrington : Langshan .. .. .. | 22 | 29 | 23 | 27 | 28 | 26 | 26 | 23 | 25 | 25 | 24 | 24 | 302 |
| W. Hilliard : Langshan .. .. .. .. | 24 | 30 | 27 | 24 | 26 | 25 | 21 | 26 | 18 | 29 | 26 | 18 | 294 |
| A. E. Brown : Langshan .. .. .. | 9 | 25 | 23 | 25 | 26 | 26 | 28 | 27 | 29 | 24 | 26 | 25 | 293* |
| W. H. Whittorn : Black Orpington .. .. | 26 | 27 | 28 | 31 | 27 | 25 | 24 | 21 | 21 | 20 | 20 | 19 | 289* |
| W. Hilliard : Langshan .. .. .. .. | 4 | 27 | 25 | 25 | 25 | 27 | 26 | 29 | 26 | 28 | 23 | 23 | 288 |
| A. R. Kennedy : Black Orpington .. .. | 18 | 23 | 24 | 25 | 24 | 27 | 29 | 26 | 27 | 20 | 22 | 23 | 288 |
| F. M. Weierter : Silver Wyandotte .. .. | 13 | 19 | 24 | 25 | 25 | 27 | 25 | 29 | 26 | 26 | 24 | 25 | 288 |
| W. H. Whittorn : Black Orpington .. .. | 25 | 27 | 27 | 28 | 27 | 29 | 22 | 23 | 15 | 18 | 15 | 26 | 282* |
| J. Waterhouse : Rhode Island Red .. .. | 2 | 22 | 21 | 22 | 26 | 29 | 28 | 29 | 25 | 25 | 25 | 25 | 279 |

* Ineligible for individual prize, eggs being underweight.

## Weights of Winning Birds.

Details of the weights of the winning birds at the beginning and end of the competition should be of interest. They are as follows:—

| | | Weight at April, 1919. | | Weight at March, 1920. | | No. of Eggs Laid. |
|---|---|---|---|---|---|---|
| *Individual Hens.* | | lb. | oz. | lb. | oz. | |
| Light Breeds— | | | | | | |
| J. J. Vaughan's White Leghorn, No. 439 ... | | 3 | 8 | 4 | 2 | 281 |
| Heavy Breeds— | | | | | | |
| A. Drayton's Black Orpington, No. 50 ... | | 5 | 6 | 5 | 0 | 303 |
| *Groups.* | | | | | | |
| Light Breeds— J. J. Vaughan's White Leghorns, Nos. | 439 | 3 | 8 | 4 | 2 | 281 |
| | 440 | 3 | 8 | 3 | 4 | 201 |
| | 441 | 3 | 8 | 3 | 10 | 258 |
| | 442 | 4 | 0 | 4 | 0 | 239 |
| | 443 | 3 | 8 | 3 | 12 | 265 |
| | 444 | 3 | 8 | 4 | 0 | 194 |
| Heavy Breeds— A. Drayton's Black Orpingtons, Nos. | 49 | 5 | 12 | 7 | 12 | 209 |
| | 50 | 5 | 6 | 5 | 0 | 303 |
| | 51 | 5 | 6 | 5 | 12 | 272 |
| | 52 | 5 | 8 | 7 | 0 | 257 |
| | 53 | 5 | 8 | 6 | 10 | 219 |
| | 54 | 5 | 4 | Dead. | | 168 |

**The Financial Aspect.**

The prices obtained for the eggs from the competition, and the Sydney wholesale prices of new laid eggs, as supplied by the Government Statistician, were as follows:—

| Month. | Hawkesbury Agricultural College Price. Per dozen. | | Sydney Wholesale Price. Per dozen. | |
|---|---|---|---|---|
| | s. | d. | s. | d. |
| April, 1919 ... ... ... | 2 | 0 | 2 | 3·75 |
| May, ,, ... ... ... | 2 | 9 | 2 | 6 |
| June, ,, ... ... ... | 3 | 0 | 2 | 9 |
| July, ,, ... ... ... | 2 | 6 | 1 | 9·6 |
| August, ,, ... ... ... | 1 | 6 | 1 | 5·75 |
| September, ,, ... ... ... | 1 | 1 | 1 | 2·75 |
| October, ,, ... ... ... | 1 | 3·5 | 1 | 4 |
| November, ,, ... ... ... | 1 | 4·5 | 1 | 4·75 |
| December, ,, ... ... ... | 1 | 7 | 1 | 7·75 |
| January, 1920 ... ... ... | 2 | 2 | 2 | 0 |
| February, ,, ... ... ... | 2 | 2 | 2 | 1·9 |
| March, ,, ... ... ... | 2 | 10 | 2 | 6·6 |
| | £1 4 | 3 | £1 3 | 1·85 |
| Less charges—<br>Freights, cartage, commission, per 12 dozen ... ... ... | 1 | 7 | 1 | 7 |
| | £1 2 | 8 | £1 1 | 6 |
| Net price per dozen ... ... ... | 1 | 11 | 1 | 10 |

The cost of feeding the 540 competition birds was £249 11s. 9d., made up of:—

| | £ | s. | d. |
|---|---|---|---|
| Wheat ... ... ... ... | 85 | 4 | 5 |
| Maize ... ... ... ... | 58 | 0 | 11½ |
| Pollard ... ... ... ... | 45 | 8 | 10 |
| Bran ... ... ... ... | 18 | 8 | 5½ |
| Lucerne dust ... ... ... | 12 | 14 | 1 |
| Meat meal ... ... ... | 12 | 1 | 5 |
| Sundries ... ... ... ... | 17 | 13 | 7 |
| | £249 | 11 | 9 |

Equal to 9s. 3d. per hen.

The total market value of the eggs laid in the year was £764 4s. 1d., so that the profit over cost of feed was £514 12s. 4d., equal to 19s. 1d. per hen.

In computing the market value of eggs laid in the competition, the Government Statistician's figure has been taken each month, in accordance with the practice which has prevailed in past years, although a somewhat more favourable result would have been shown on taking the actual prices realised by the College.

## ANNUAL COMPETITION.

Full details of the financial and other results since the inception of the competitions are given in the following comparative table:—

| | No. of Groups. | Winning Total. | Lowest Total. | Highest Monthly Total. | Average per Hen. | Greatest Value. | Average Net Price of Eggs. | Average Value per Hen. | Cost of Feed per Hen. | Balance over Feed. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1st ... | 38 | 1,113 | 459 | 137 | 130 | 140/- | 1/1 | 15/6 | 6/- | 9/6 |
| 2nd ... | 70 | 1,308 | 666 | 160 | 163 | 150/- | 1/3¾ | 17/9 | 5/9¾ | 12/- |
| 3rd .. | 100 | 1,224 | 532 | 154 | 152 | 114/- | 1/- | 12/9 | 4/5½ | 8/3 |
| 4th ... | 100 | 1,411 | 635 | 168 | 166 | 125/- | -/11½ | 13/3 | 5/3½ | 8/- |
| 5th ... | 100 | 1,481 | 721 | 162 | 171 | 137/- | 1/0½ | 14/10 | 5/10 | 9/- |
| 6th ... | 60 | 1,474 | 665 | 161 | 173 | 149/- | 1/2¼ | 17/2 | 7/- | 10/2 |
| 7th ... | 50 | 1,379 | 656 | 159 | 180 | 146/- | 1/3¼ | 19/2 | 7/9½ | 11/4 |
| 8th ... | 60 | 1,394 | 739 | 158 | 181 | 173/- | 1/5¼ | 21/9 | 6/9 | 15/- |
| 9th ... | 40 | 1,321 | 658 | 151 | 168 | 134/5 | 1/2 | 16/3½ | 6/5½ | 10/2 |
| 10th ... | 50 | 1,389 | 687 | 146 | 184 | 141/9 | 1/2½ | 18/5½ | 6/1½ | 12/4 |
| 11th ... | 50 | 1,461 | 603 | 156 | 178 | 164/7 | 1/3½ | 19/4¼ | 7/3½ | 12/0¾ |
| 12th ... | 50 | 1,360 | 724 | 152 | 177 | 145/3 | 1/2½ | 17/7 | 5/9 | 11/10 |
| 13th ... | 63 | 1,541 | 705 | 162 | 181 | 152/9 | 1/2 | 17/8½ | 6/9½ | 10/11 |
| 14th .. | 70 | 1,449 | 506 | 165 | 192 | 172/7 | 1/4½ | 22/2 | 7/7 | 14/7 |
| 15th A | 40 | 1,526 | 924 | 162 | 216 | 171/11 | 1/3¾ | 23/8¾ | 6/10 | 16/10¾ |
| 15th B | 30 | 1,479 | 749 | 165 | 192 | 171/3 | 1/3¾ | 21/7½ | 6/10 | 14/9½ |
| 16th A | 40 | 1,525 | 923 | 157 | 209 | 166/2¼ | 1/4 | 21/9¾ | 7/8 | 14/1¾ |
| 16th B | 30 | 1,613 | 931 | 170 | 202 | 172/3¼ | 1/4 | 21/2 | 7/8 | 13/6 |
| 17th A | 40 | 1,448 | 860 | 153 | 199 | 168/3 | 1/5½ | 22/0½ | 7/10 | 14/2½ |
| 17th B | 30 | 1,517 | 815 | 151 | 189 | 183 6¾ | 1/5½ | 21/11¼ | 7/10 | 14/1¼ |
| 18th A | 30 | 1,438 | 988 | 148 | 203 | 207/6 | 1/10 | 28/10 | 9/3 | 19/7 |
| 18th B | 50 | 1,428 | 745 | 151 | 190 | 210/7 | 1/10 | 28/1 | 9/3 | 18/10 |
| 18th C1 | 3 | 1,304 | 977 | 138 | 195 | 185/8 | 1/10 | 27/8 | 9/3 | 18/5 |
| 18th C2 | 7 | 1,336 | 955 | 150 | 191 | 190/7 | 1/10 | 28/5 | 9/3 | 19/2 |

## EIGHTEENTH ANNUAL COMPETITION—*Analysed.*

| | Eggs per Hen. | Average Weight of eggs per doz. | Value per Hen. |
|---|---|---|---|
| ***Section A.*** | | oz. | £ s. d. |
| 168 White Leghorns ... | 204·4 | 25·7 | 1 9 0 |
| 6 Brown ,, ... | 205 | 24·5 | 1 8 10 |
| 6 Anconas ... | 176·3 | 25·5 | 1 4 9 |
| ***Section B.*** | | | |
| 210 Black Orpingtons ... | 192·6 | 25·24 | 1 7 10 |
| 48 Langshans ... ... | 205·3 | 25·1 | 1 10 4 |
| 12 Plymouth Rocks ... | 152 | 24·8 | 1 2 1 |
| 6 Rhode Island Reds... | 175 | 24·25 | 1 6 6 |
| 24 Silver Wyandottes.. | 198·3 | 23·75 | 1 9 1 |
| ***Section C1.*** | | | |
| 18 White Leghorns ... | 195·4 | 26·1 | 1 7 8 |
| ***Section C2.*** | | | |
| 18 Rhode Island Reds... | 184 | 25·6 | 1 6 2 |
| 18 Langshans ... ... | 188·3 | 23·8 | 1 7 1 |
| 6 Silver Wyandottes .. | 222·6 | 24·5 | 1 14 0 |

## AWARDS OF PRIZES AND CERTIFICATES.

### Grand Champion Prize.

Grand Champion Prize of £5 5s. (or trophy to that value), for greatest number of eggs laid by group of six birds during the twelve months without replacement of a bird—J. J. Vaughan, White Leghorns, 1,438 eggs.

### Sections A and C1.

Greatest number of eggs laid during twelve months (individual hens). Five prizes, £3, £2 10s., £2, £1 10s., and £1.—J. J. Vaughan, White Leghorn (No. 439), 281 eggs (1); G. A. Baxter, White Leghorn (No. 320), 280 eggs (2); A. Messervy, White Leghorn (No. 489), 265 eggs, and J. J. Vaughan, White Leghorn (No. 443), 265 eggs, divide 3rd and 4th prizes; E. T. Rhodes, White Leghorn (No. 426), 264 eggs (5).

Greatest number of eggs laid during twelve months (groups of six birds). Four prizes, £2 10s., £2, £1 10s., and £1.—J. J. Vaughan, White Leghorns, 1,438 eggs (1); E. T. Rhodes, White Leghorns, 1,436 eggs (2); G. A. Baxter, White Leghorns, 1,359 eggs (3); L. K. Pettit, White Leghorns, 1,318 eggs (4).

Quarterly prizes (groups of six birds):—

Winter test (1st April to 30th June, 1919). Prizes, £2 and £1 10s.—G. A. Baxter, 331 eggs (1); J. J. Vaughan, 291 eggs (2).

Spring test (1st July to 30th September, 1919). Prizes, £1 10s. and £1.—G. A. Baxter, 386 eggs (1); A. Gliddon, 385 eggs (2).

Summer test (1st October to 31st December, 1919). Prizes, £1 10s. and £1.—E. T. Rhodes, 437 eggs (1); J. J. Vaughan, 431 eggs (2).

Autumn test (1st January to 31st March, 1920). Prizes, £2 and £1 10s.—E. T. Rhodes, 372 eggs (1); T. Partridge, 347 eggs (2).

Highest average for twelve months (groups of six or five birds). Four prizes, £3, £2 10s., £2, and £1 10s.—G. A. Baxter, White Leghorns, 1,208 eggs (five birds) (1); J. J. Vaughan, White Leghorns, 1,438 eggs (six birds) (2); E. T. Rhodes, White Leghorns, 1,436 eggs (six birds) (3); R. Whitelaw, White Leghorns, 1,180 eggs (five birds) (4).

### Sections B and C2.

Greatest number of eggs laid during twelve months (individual hens). Five prizes, £3, £2 10s., £2, £1 10s., and £1.—A. Drayton, Black Orpington (No. 50), 303 eggs (1); H. J. Durrington, Langshan (No. 233), 302 eggs (2); W. Hilliard, Langshan (No. 534), 294 eggs (3); W. Hilliard, Langshan (No. 533), A. R. Kennedy, Black Orpington (No. 124), and F. M. Weierter, Silver Wyandotte (No. 540), each laid 288 eggs and divided 4th and 5th prizes.

Greatest number of eggs laid during twelve months (groups of six birds). Four prizes, £2 10s., £2, £1 10s., and £1.—A. Drayton, Black Orpingtons, 1,428 eggs (1); H. S. Lewis, Black Orpingtons, 1,415 eggs (2); C. Judson, Black Orpingtons, 1,353 eggs (3); A. E. Brown, Langshans, 1,345 eggs (4).

Quarterly Prizes (groups of six birds):—

Winter test (1st April to 30th June, 1919). Prizes, £2 and £1 10s.—W. H. Whittorn, Black Orpingtons, 385 eggs (1); A Drayton, Black Orpingtons, 371 eggs (2).

Spring test (1st July to 30th September, 1919). Prizes, £1 10s. and £1.—A. Drayton, Black Orpingtons, 436 eggs (1); D. Rees, Langshans, 435 eggs (2).

Summer test (1st October to 31st December, 1919). Prizes, £1 10s. and £1.—H. S. Lewis, Black Orpingtons, 393 eggs (1); A. R. Kennedy, Black Orpingtons, 386 eggs (2).

Autumn test (1st January to 31st March, 1920). Prizes, £2 and £1 10s.—D. Frew, junr., Langshans, 316 eggs (1); G. E. Holmes, Black Orpingtons, 314 eggs (2).

Highest average for twelve months (groups of six or five birds). Four prizes: £3, £2 10s., £2, and £1 10s.—A. Drayton, Black Orpingtons, 1,428 eggs (six birds) (1); H. S. Lewis, Black Orpingtons, 1,415 eggs (six birds) (2); H. J. Durrington, Langshans, 1,140 eggs (five birds) (3); F. M. Weierter, Silver Wyandottes, 1,131 eggs (five birds) (4).

### Quality Prizes.

Twelve groups conforming most closely to type were selected in each of Sections A and B for prizes of £5 and £2 10s., provided the winners laid 1,150 eggs or more in twelve months. The winners were :—

*Section* A.—J. J. Vaughan, 1,438 eggs, White Leghorns (1) ; A. Gliddon, 1316 eggs, White Leghorns (2).

*Section* B.—A. E. Brown, 1,345 eggs, Langshans (1) ; D. Frew, junr., 1,292 eggs, Langshans (2).

**Three of Mr. H. S. Lewis's group of Black Orpingtons.**

Winner of second prize in Eighteenth Annual Competition (1,415 eggs) in Heavy Breeds Section.

Prizes of £2 and £1 were awarded in each of Sections C1 and C2 for the greatest number of eggs laid by groups of six birds, subject to 1,000 eggs or more being laid.

*Section* C1.—A. Messervy, 1,304 eggs, White Leghorns (1) ; C. McKendry, 1,237 eggs, White Leghorns (2).

*Section* C2.—F. M. Weierter, 1,336 eggs, Silver Wyandottes (1) ; J. Waterhouse, 1,314 eggs, Rhode Island Reds (2).

### Certificates.

For groups of six pens laying 1,300 eggs or more during the twelve months :—

J. J. Vaughan (White Leghorns), 1,438 eggs ; E. T. Rhodes (White Leghorns), 1,436 eggs ; A. Drayton (Black Orpingtons), 1,428 eggs ; H S. Lewis (Black Orpingtons), 1,415 eggs ; G. A. Baxter (White Leghorns), 1,359 eggs ; C. Judson (Black Orpingtons), 1,353 eggs ; A. E. Brown (Langshans), 1,345 eggs ; A. R. Kennedy (Black Orpingtons), 1,334 eggs ; W. H. Whittorn (Black Orpingtons), 1,331 eggs ; L. K. Pettit (White Leghorns), 1,318 eggs ; P. C. McDonnell (Black Orpingtons), 1,317 eggs ; A. Gliddon (White Leghorns), 1,316 eggs ; J. Waterhouse (Rhode Island Reds), 1,314 eggs ; A. Messervy (White Leghorns), 1,304 eggs.

## THE POULTRY EXPERT'S REVIEW.

In the competition just concluded there is a notable absence of any outstanding record, either in groups, single hens, or general averages. As a matter of fact, the general average has slipped back to very close to that of 1916. It should be remembered, however, that in that year a big advance had been made from 184, the previous highest (made in 1910), to 192 eggs per hen, the improvement having succeeded upon the minimum weight regulation. This average was followed by 205 in 1917 and 206 in 1918 ; last year (1919), notwithstanding some high records in the different sections, the general average slipped back to 195, and this year it has recovered a little to 197. Although retrogression has taken place to that extent, we are still above the point where the improvement took place in 1916 and onwards for the following three years. However, the large number of rejections made at the incoming of the birds at the commencement of last competition did not augur well for the success of the 1919–20 test, nor did the incidence of so much disturbance in the penning help matters.

During the closing days of the competition more than ordinary interest was aroused owing to the close running of the leading groups and single hens for first place in practically each section. In the case of the light section, this continued right up to the morning of the last day of the test, when Messrs. Rhodes and Vaughan's groups were tieing for first place. During the day the position was determined in favour of Mr. Vaughan's pen by his birds laying five eggs and Mr. Rhodes' only three, leaving a win by two eggs for the former. Much the same position was occupied in the single hen test between Messrs. Vaughan's and Baxter's hens.

In the heavy breed group section, the position was sufficiently determined some days before to make it plain that Mr. Drayton would beat his opponent. But in the single hens a close finish for first prize took place between Mr. Drayton's and Mr. Durrington's birds, ending in favour of the former by one egg.

During the whole test Mr. Messervy's group in the standard section (light breeds) was running between third and fourth place.

Remarking in my last report on the quality, it was pointed out that it was only to be feared that the lack of quality as indicated by so many rejections was possibly a reflex of what was taking place on some of our farms. This is a feature which should occupy the very serious attention of competitors, because if the retrogression continues we shall soon fall back to the average preceding the high tallies that have been made in recent years. The most notable falling off in recent tests is in the Black Orpingtons, and the question arises has this breed passed its zenith like so many other breeds have done, or is the decline due to instability of type and character? However, judging from the birds just passed into the 1920–21 test, I am hopeful that next year's results will show some recovery in all sections.

### The Size of Eggs.

There has been some criticism in respect of the alleged falling off in the size of eggs, and the number of disqualifications in recent tests on that account. The following table of average weights of eggs during the last eight tests will be of interest to competitors and onlookers in this connection.

**Three of Mr. A. Messervy's group of White Leghorns.**

Leading pen in Light Breeds Standard Section (1,304 eggs).

Starting at a point from where the retrogression is alleged to have manifested itself, we find :—

Weights of Eggs per dozen.

| | | oz. | | | oz. |
|---|---|---|---|---|---|
| 1913 | Eleventh Annual Test ... | $24\frac{1}{2}$ | 1917 | Fifteenth Annual Test ... | $26\frac{3}{4}$ |
| 1914 | Twelfth ,, ,, ... | $24\frac{3}{4}$ | 1918 | Sixteenth ,, ,, ... | $24\frac{3}{4}$ |
| 1915 | Thirteenth ,, ,, ... | $24\frac{3}{4}$ | 1919 | Seventeenth ,, ,, ... | $25\frac{1}{16}$ |
| 1916 | Fourteenth ,, ,, ... | $26\frac{3}{4}$ | 1920 | Eighteenth ,, ,, ... | $25\frac{1}{4}$ |

It will be observed that, as might be expected, fluctuations have occurred, but on the eight years cited it will be seen that no retrogression—on the contrary, progress—has been made, and it is noteworthy that the highest average weight of eggs followed upon the introduction of the minimum weight regulation, as did also the highest tallies made in the whole series of tests. Viewing the criticism referred to, it would appear that the critics have overlooked the significance of the change from group competitions to single hens. Under the group system, the light weight of one or perhaps

**Three of Mr. F. M. Weierter's group of Silver Wyandottes.**

Leading pen in Heavy Breeds Standard Section (1,336 eggs).

more hens was made up by the heavier ones in the same group. In the single pen system, of course, there can be no such compensating factor. Every individual hen must lay an egg at least 2 oz. in weight, and eggs from each group must weigh at least 24 oz. per dozen to qualify for a prize.

Another point upon which critics of the competition have stumbled is the significance of the extension of time for taking the weights from four to

six months. This has been regarded as a sign that eggs were getting smaller, and that more time was allowed on that account; as a matter of fact it had no such significance. The extension of time arises out of the necessities brought about by the change to single-hen penning. Under the group system it was comparatively easy to obtain the weights within the four months stipulated, but experience with the single-hen test has proved it to be most difficult to obtain eggs for the purpose of weighing from every individual hen within the four months, hence the extension of the time to six months.

### Standard Section.

The performances of the birds in the standard section has amply justified the innovation, and the result will serve to disabuse many poultry keepers of the fallacy, which has become only too prevalent, that standard bred birds are all poor layers. Again, it was only common justice to a deserving class of breeders who spend both money and time in the production of high class birds that they should have some representation in these competitions. Here again the Hawkesbury Agricultural College Competition Committee has set a precedent which we find others quick to follow. It has lately come under notice that the egg-laying competition being conducted at the Harper Adams College in England has decided to follow our lead this year, not only by making a section for standard bred birds in their competitions, but also by adopting the single pen system.

### Detailed Returns.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE EIGHTEENTH ANNUAL COMPETITION.

| Owner and Breed. | Totals of Individual Birds. | | | | | | Total of Groups. | Weight of Eggs per dozen. | Total Market Value. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Section A—(Light Breeds).* | | | | | | | | | | | |
| | | | | | | | | oz. | £ | s. | d. |
| J. J. Vaughan : White Leghorns .. .. | 281 | 201 | 258 | 239 | 265 | 194 | 1,438 | 25·7 | 10 | 6 | 3 |
| E. T. Rhodes : White Leghorns .. .. | 260 | 213 | 228 | 228 | 243 | 264 | 1,436 | 25 | 10 | 7 | 6 |
| G. A. Baxter : White Leghorns .. .. | 254 | 280 | 253 | 151† | 217 | 204 | 1,359 | 25 | 9 | 18 | 0 |
| L. K. Pettit : White Leghorns .. .. | 258‡ | 211 | 262 | 212 | 205 | 170 | 1,318 | 25·5 | 9 | 10 | 0 |
| A. Gliddon : White Leghorns .. .. .. | 236 | 177 | 180* | 247 | 214 | 262 | 1,316 | 25·7 | 9 | 8 | 9 |
| C. Leach : White Leghorns .. .. .. | 238 | 188 | 165 | 239 | 246 | 223 | 1,299 | 25·7 | 9 | 6 | 8 |
| J. M. Brooke : White Leghorns .. .. | 215 | 230 | 247 | 220 | 224 | 162 | 1,298 | 25·5 | 9 | 3 | 8 |
| H. A. Gradwell : White Leghorns .. .. | 226 | 239 | 166 | 229‡ | 187 | 251 | 1,298 | 26·5 | 9 | 9 | 8 |
| J. R. Stewart : White Leghorns .. .. | 213 | 245 | 196 | 224 | 188 | 214 | 1,280 | 25·2 | 9 | 3 | 4 |
| T. Partridge : White Leghorns .. .. | 219 | 204 | 220 | 187 | 229 | 204 | 1,263 | 25 | 8 | 18 | 3 |
| R. Whitelaw : White Leghorns .. .. | 248 | 74† | 246 | 241 | 214 | 231 | 1,254 | 25·2 | 8 | 15 | 11 |
| A. H. Burwood : Brown Leghorns .. .. | 183 | 199 | 210 | 192 | 216 | 230 | 1,230 | 24·5 | 8 | 13 | 4 |
| F. L. Parker : White Leghorns .. .. | 208* | 206 | 243 | 240 | 148 | 181* | 1,226 | 25·5 | 8 | 12 | 0 |
| Willow Grange Poultry Farm : White Leghorns .. .. .. .. .. | 232‡ | 222 | 212 | 181 | 149 | 230 | 1,226 | 24·7 | 8 | 16 | 11 |
| W. Maskell : White Leghorns .. .. .. | 200 | 244 | 199 | 186 | 192 | 189 | 1,210 | 26 | 8 | 10 | 6 |
| C. Kennett : White Leghorns .. .. .. | 165 | 220 | 192 | 196 | 220 | 215 | 1,208 | 26·2 | 8 | 6 | 3 |
| F. S. Longley : White Leghorns .. .. | 200 | 198 | 242 | 157 | 205 | 201 | 1,203 | 26·2 | 8 | 8 | 4 |
| A. H. Jones : White Leghorns .. .. | 233 | 212‡ | 252 | 224* | 215 | 64 | 1,200 | 24·2 | 8 | 9 | 8 |
| T. E. Jarman : White Leghorns . .. | 225† | 199 | 211* | 207 | 178 | 175 | 1,195 | 26·2 | 8 | 6 | 10 |
| J. W. McKendry : White Leghorns .. .. | 163 | 165 | 177‡ | 222 | 228* | 235 | 1,190 | 24·7 | 8 | 7 | 5 |
| T. V. Gardner : White Leghorns .. .. | 187 | 249 | 111† | 212 | 224 | 204 | 1,187 | 25 | 8 | 10 | 0 |
| L. Bulluss : White Leghorns .. .. .. | 223 | 172 | 256 | 190 | 216 | 127 | 1,184 | 25 | 8 | 9 | 10 |
| Elliott Bros. : White Leghorns .. .. | 228 | 167 | 204 | 158 | 181 | 239 | 1,177 | 26 | 8 | 4 | 10 |
| W. I. Baker : White Leghorns.. .. . | 173 | 231 | 159 | 262 | 135 | 203 | 1,163 | 25·5 | 8 | 2 | 7 |
| H. C. Bailey : White Leghorns .. .. | 214 | 90† | 201 | 223 | 244 | 179 | 1,151 | 26·7 | 8 | 6 | 3 |
| Mrs. M. Barrett : White Leghorns .. .. | 104† | 227 | 223 | 120 | 241 | 221 | 1,136 | 25·5 | 8 | 2 | 0 |
| A. G. Noldart : White Leghorns .. .. | 170 | 195 | 146 | 219 | 171 | 229 | 1,130 | 26·5 | 7 | 16 | 4 |
| F. M. Lambert : Anconas .. .. .. | 152 | 211 | 149 | 151 | 223 | 172 | 1,058 | 25·5 | 7 | 8 | 5 |
| J. Gillies : White Leghorns .. .. .. | 77† | 214 | 176 | 174 | 140 | 219 | 1,000 | 26·5 | 7 | 0 | 0 |
| J. Rayner : White Leghorns .. .. .. | 205 | 180 | 177 | 170 | 100† | 156 | 988 | 26·5 | 6 | 14 | 11 |

* Signifies bird replaced, score struck out. † Signifies bird dead, not replaced.
‡ Disqualified for prizes, eggs being under weight.

EGG-YIELDS OF EACH BIRD AND GROUP IN THE EIGHTEENTH ANNUAL COMPETITION—*continued.*

## *Section B—(Heavy Breeds).*

| Owner and Breed. | Totals of Individual Birds. | | | | | | Total of Groups. | Weight of Eggs per dozen. | Total Market Value. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | oz. | £ s. d. |
| A. Drayton: Black Orpingtons .. .. | 209 | 303 | 272 | 257 | 219 | 168† | 1,428 | 26·2 | 10 10 7 |
| H. S. Lewis: Black Orpingtons .. .. | 257 | 265 | 208 | 231 | 258‡ | 196 | 1,415 | 25·5 | 10 5 11 |
| C. Judson: Black Orpingtons .. .. | 184 | 236 | 191 | 241‡ | 233 | 268 | 1,353 | 24·2 | 9 14 10 |
| A. E. Brown: Langshans .. .. .. | 213 | 213 | 239 | 293‡ | 260 | 127 | 1,345 | 26 | 10 1 1 |
| A. R. Kennedy: Black Orpingtons .. .. | 174 | 222 | 195 | 288 | 239 | 216 | 1,334 | 25·5 | 9 12 5 |
| W. H. Whittorn: Black Orpingtons.. .. | 289‡ | 45† | 282‡ | 278 | 226 | 211 | 1,331‡ | 23·5 | 10 0 3 |
| P. C. McDonnell: Black Orpingtons . | 260 | 213 | 214 | 218* | 209 | 203 | 1,317 | 26 | 9 8 7 |
| F. J. Morison: Black Orpingtons .. .. | 209 | 239 | 225 | 229 | 161 | 232 | 1,295 | 26·5 | 9 9 9 |
| D. Frew, junr.: Langshans . .. | 211 | 180 | 253 | 225 | 245 | 178 | 1,292 | 24·7 | 9 14 0 |
| A. J. Nolan: Silver Wyandottes .. .. | 169‡ | 239 | 222 | 203 | 203 | 221 | 1,257 | 24·2 | 9 2 1 |
| A. Campbell: Langshans .. .. .. | 217 | 223 | 247 | 218† | 187 | 160 | 1,252 | 26 | 9 6 2 |
| V. H. Dariel: Black Orpingtons .. .. | 218 | 230 | 188 | 225 | 274 | 164 | 1,249 | 25·2 | 8 19 2 |
| F. R. Rooke: Black Orpingtons .. .. | 171 | 229 | 247 | 235‡ | 156 | 208 | 1,246 | 24 | 8 18 2 |
| H. J. Durrington: Langshans .. .. | 147 | 101†‡ | 273 | 175 | 302 | 243 | 1,241 | 24·2 | 9 3 6 |
| A. B. Laverack: Langshans .. .. .. | 194 | 243‡ | 185 | 203 | 230 | 181 | 1,236 | 25·7 | 9 0 0 |
| O. H. Walton: Silver Wyandottes .. .. | 173 | 180 | 235 | 208 | 202‡ | 238 | 1,236 | 24·2 | 9 1 4 |
| Paika Poultry Farm: Langshans .. .. | 257 | 190‡ | 231 | 174‡ | 173 | 204 | 1,229‡ | 23·7 | 8 19 2 |
| D. Kenway: Black Orpingtons .. .. | 103 | 271 | 216 | 172 | 231 | 223 | 1,216 | 25 | 8 19 0 |
| aMrs W. V. Hopkins: Black Orpingtons .. | 208‡ | 217 | 187 | 196 | 186 | 221‡ | 1,215 | 24 | 8 14 2 |
| J. H. Madrers: Black Orpingtons .. .. | 237 | 202 | 248 | 184 | 199 | 145 | 1,215 | 26 | 8 16 2 |
| E. J. Kinney: Silver Wyandottes .. .. | 190 | 240 | 185‡ | 161‡ | 209‡ | 228 | 1,213‡ | 22 | 8 19 8 |
| G. E. Holmes: Black Orpingtons .. .. | 201 | 252 | 198* | 180 | 197 | 171 | 1,199 | 28 | 8 17 4 |
| J. Wheller: Black Orpingtons .. .. | 219 | 252 | 209 | 212 | 185 | 121‡ | 1,198 | 25 | 8 16 2 |
| C. E. Banks: Langshans .. .. .. | 261 | 165 | 207 | 108† | 184 | 272‡ | 1,197 | 24·5 | 8 12 9 |
| R. P. Manton: Black Orpingtons .. .. | 140 | 178 | 185 | 245 | 247 | 195‡ | 1,190 | 24·5 | 8 12 4 |
| J. Roberts: Black Orpingtons.. .. .. | 163 | 227 | 198 | 201 | 233‡ | 145 | 1,167 | 24·5 | 8 6 2 |
| Hambly and Wales: Black Orpingtons .. | 132 | 202 | 227 | 229 | 169 | 203 | 1,162 | 26·2 | 8 9 5 |
| A. Benson: Black Orpingtons .. .. | 248 | 163 | 176 | 207 | 132 | 235 | 1,161 | 24·2 | 8 10 8 |
| J. King: Black Orpingtons .. .. .. | 223 | 124† | 212‡ | 209 | 189 | 193 | 1,150 | 25 | 8 5 0 |
| G. Hopping: Black Orpingtons .. .. | 207 | 146 | 199 | 182 | 190 | 224 | 1,148 | 24·5 | 8 7 5 |
| A. Chick: Black Orpingtons .. .. .. | 189 | 181 | 228† | 204 | 151* | 155‡ | 1,108‡ | 23·7 | 7 12 5 |
| P. G. Heath: Black Orpingtons .. .. | 248‡ | 193 | 100 | 202 | 192 | 157 | 1,092 | 25·5 | 7 10 3 |
| Fetherston Bros.: Black Orpingtons .. | 194‡ | 201 | 99 | 234 | 143 | 216 | 1,087 | 24 | 8 4 3 |
| W. E. Webster: Black Orpingtons .. .. | 216 | 185 | 222 | 139* | 223 | 102 | 1,087 | 25 | 7 6 4 |
| A. A. Leal: Black Orpingtons .. .. | 158 | 197 | 222 | 163 | 147 | 192 | 1,079 | 25 | 7 8 1 |
| Grasemere Poultry Farm: Black Orpingtons | 161 | 207 | 194 | 141 | 170 | 200 | 1,073 | 25 | 8 3 11 |
| C. Bloomfield: Black Orpingtons .. .. | 229 | 217 | 155 | 123 | 200 | 138 | 1,062 | 27 | 7 11 6 |
| F. Fuggle: Langshans .. .. .. .. | 199 | 246‡ | 223 | 36† | 110† | 247 | 1,061 | 25·7 | 7 19 4 |
| W. H. Hampton and Son: Black Orpingtons | 258 | 144* | 94 | 131 | 189 | 239 | 1,055 | 25·5 | 7 14 0 |
| W. H. Forsyth: Silver Wyandottes .. .. | 171 | 217* | 159 | 112* | 182 | 212* | 1,053 | 24·5 | 7 14 6 |
| J. T. Brett: Rhode Island Reds .. .. | 209 | 192 | 174 | 117† | 168 | 190 | 1,050 | 24·2 | 7 19 0 |
| L. J. Fereday: Black Orpingtons .. .. | 204 | 127 | 171 | 87† | 213 | 248 | 1,050 | 24·2 | 8 0 5 |
| D. Dryburgh: Black Orpingtons .. .. | 209* | 153† | 159* | 161 | 231 | 127 | 1,040 | 25·5 | 7 10 6 |
| H. Jobling: Black Orpingtons .. .. | 222 | 245 | 156* | 63 | 144 | 207 | 1,037 | 25·5 | 7 4 4 |
| B. A. Maher: Black Orpingtons .. .. | 117 | 190 | 175 | 154 | 171 | 218 | 1,025 | 25·7 | 7 5 4 |
| F. J. Shanley: Black Orpingtons .. .. | 201 | 287‡ | 99 | 203 | 22‡ | 177 | 989 | 25·2 | 7 8 2 |
| J. D. Martin: Plymouth Rocks .. .. | 213 | 135 | 166 | 168 | 130 | 144 | 956 | 25·2 | 6 17 9 |
| Bella Vista Poultry Farm: Black Orpingtons | 76 | 134† | 196 | 203 | 141 | 194 | 944 | 25·5 | 6 12 4 |
| Cimbria Poultry Farm: Plymouth Rocks . | 157 | 142 | 112 | 115 | 216 | 126† | 868 | 24·5 | 6 7 8 |
| Christie and Son: Black Orpingtons .. | 145 | 87‡ | 86 | 197 | 219 | 11† | 745 | 26·5 | 5 6 2 |

## *Section C1—Standard Section (Light Breeds).*

| Owner and Breed. | Totals of Individual Birds. | | | | | | Total of Groups. | Weight of Eggs per dozen. | Total Market Value. |
|---|---|---|---|---|---|---|---|---|---|
| A. Messervy: White Leghorns .. .. | 195 | 230 | 265 | 227† | 143 | 244 | 1,304 | 25·5 | 9 5 8 |
| C. McKendry: White Leghorns .. .. | 236 | 187 | 210 | 240 | 153 | 211 | 1,237 | 26·2 | 8 14 6 |
| N. J. McAppion: White Leghorns .. .. | 207 | 22† | 194 | 262 | 80* | 212 | 977 | 26·6 | 6 17 11 |

## *Section C2—Standard Section (Heavy Breeds).*

| Owner and Breed. | Totals of Individual Birds. | | | | | | Total of Groups. | Weight of Eggs per dozen. | Total Market Value. |
|---|---|---|---|---|---|---|---|---|---|
| F. M. Weierter: Silver Wyandottes .. .. | 234 | 205† | 181 | 231 | 197 | 288 | 1,336 | 24·5 | 10 3 10 |
| J. Waterhouse: Rhode Island Reds .. .. | 216 | 133 | 279 | 245 | 212 | 229 | 1,314 | 26·7 | 9 10 7 |
| D. Rees: Langshans .. .. .. .. | 221‡ | 260 | 216 | 198 | 228* | 154‡ | 1,277 | 24 | 9 5 7 |
| W. Hilliard: Langshans .. .. .. | 186 | 59† | 169‡ | 162‡ | 288 | 294 | 1,158‡ | 23·5 | 8 6 5 |
| R. M. Griffiths: Rhode Island Reds .. .. | 173 | 237‡ | 164 | 143† | 126 | 181 | 1,024 | 25 | 7 6 4 |
| J. F. Dalrymple: Rhode Island Reds .. | 176 | 164 | 129 | 183 | 178 | 143 | 973 | 25·2 | 6 14 6 |
| Standard Poultry Yards: Langshans .. | 204 | 137 | 76 | 218 | 165 | 155 | 955 | 24 | 6 15 9 |

* Signifies bird replaced, score struck out. † Signifies bird dead, not replaced.
‡ Disqualified for prizes, eggs being under weight. *a* Hen competing as from the 1st May only.

# Poultry Notes.

## MAY.

JAMES HADLINGTON, Poultry Expert.

IN the space of a few weeks the hatching season will again be upon us, and as mentioned last month, the sooner the breeding stock is in the pens now, the better. With the high prices that will be ruling for eggs during the winter, there will be a disinclination on the part of poultry-farmers to set eggs as early as they should be set, and if the temptation to sell eggs rather than set them is not resisted to the point of sacrifice, next rearing season will witness a crop of late chickens and only a small number of early ones. I fear that, no matter what may be advised, a curtailment of hatching during this coming winter is inevitable, but this very fact should encourage breeders who are able to do so to make the necessary temporary sacrifice, because of the high prices for eggs and table poultry that may be looked for next spring and summer.

The position will be something like this during the winter months:—Eggs will probably be worth 1½d. each over what they would command in normal times. If we base our calculation on two eggs to hatch one chicken, it will mean 3d. per chicken, or 6d. per pair, above the cost for eggs in normal times. It is fairly safe to forecast a substantial increase in the prices received for both eggs and table poultry, and it is therefore reasonable to assume that it will pay just as well, and probably better, to set eggs this winter, dear as they probably will be, than under normal conditions.

In furnishing this advice I am not overlooking the high cost of feeding, but it is safe to assume from past experience that, by the time the factors we are examining are operative, the levelling up process between the higher cost of food and higher prices for our products will have taken effect, and the poultry-farmer who has been able to carry on through the autumn and winter will be in a stronger position.

Our motto this season should be "Set eggs as usual." Start putting available eggs down from 1st June, no matter whether heavy or light breeds, and get a succession of eggs down one week after the other from that date. Farmers who have followed the advice given in these notes on this subject are more than satisfied with the result.

### Hatching with Incubators.

Points on artificial incubation have appeared in these notes as late as 1918, but, as the subject is one of vital interest to beginners at this season of the year, a reminder on how to operate an incubator is again given with some references to matters not previously dealt with.

1. *A Sanitary Incubator.*—See that the incubator is in good sanitary condition.

2. *Thermometers.*—Test all thermometers before starting the season, and again later on.

3. *Starting the Hatch.*—When starting an incubator, the temperature should be got up to, and maintained at, 103 degrees for at least twelve hours before the eggs are put in. When the eggs are put in, the temperature will fall, and it is best to allow about another twelve hours for the heat to rise to 102, at which point the incubator should be regulated to run steady. It is a mistake to raise the temperature too fast. If a lamp machine is in use, the lamp should be kept quite clean and the wick free from incrustation.

4. *Eggs.*—Fresh eggs, under a week old, and from physically strong stock, are necessary to ensure successful hatching.

5. *Operating.*—Before starting the incubator see that the regulating device is in perfect working order.

6. *Temperature.*—Bring the temperature in the incubator up to 102 degrees; this should be raised another degree as the hatch progresses. Between 102 and 103 degrees is the best temperature to run at, leaning to the high side towards the end of the hatch. When the first egg is seen to be chipped, which may occur on the nineteenth day if the eggs be fresh, let the temperature run up to 104 to 105 degrees until the hatch is finished. For these temperatures the bulb of the thermometer should stand just clear of the eggs; half an inch above is a good position.

7. *Turning.*—Commence to turn the eggs after they have been in the machine thirty-six hours, and turn them at least twice daily up to the ninth day; once per day afterwards is all that is absolutely necessary. Stop turning when the first egg is seen to be chipped.

8. *Testing.*—The eggs should be tested about the sixth or seventh day; at that time even a novice can generally pick out the infertile eggs with a good tester.

9. *Cooling.*—Commence cooling the eggs for a few minutes once per day after the sixth day, and gradually increase the time of cooling as the hatch progresses—first to ten minutes, then to fifteen, and up to twenty or even thirty minutes, according to the temperature of the room. But eggs should not be cooled for thirty minutes as a regular thing nor too often. Cooling should be stopped when the first egg is chipped.

10. *Ventilation.*—Little, if any, ventilation is required up to the time of commencing to cool, about the sixth day. A graduated amount of ventilation may then be allowed up to the time the first egg is chipped, when the ventilators are better nearly closed. Most incubators are over-ventilated. Experience proves that applied moisture is unnecessary and in many cases harmful, and most large operators dispense with it altogether.

## Temperatures of Eggs and Incubator.

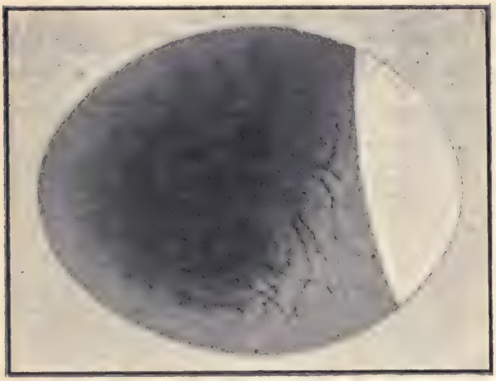
It may not be generally known that there is a difference between the temperature of the eggs under incubation and that of the incubator in which they are contained. The temperature of the egg itself in the early stages is generally about 2 degrees Fah. below that registered by the thermometer in the incubator. Thus if 102 degrees is shown in the drawer at ½ inch above the eggs, that of the egg itself is about 100 degrees. After the ninth day the temperature of the eggs will rise to 101 degrees and the incubator to 103 degrees, at which it should be allowed to remain. After about the thirteenth day another degree is gained by the eggs, while the temperature in the incubator still remains the same. About the nineteenth day 104 degrees should be allowed in the incubator, and that of the eggs will rise to 103 degrees. The temperature in the incubator should thereafter stand at 104 degrees to 105 degrees until the conclusion of the hatch. This is a critical stage and the temperature of the incubator should be kept as steady as possible and on the high side rather than lower. The effect of allowing the temperature supplied by the incubator to fall down to, or below, that of the eggs is to cause a reverse radiation from the eggs. It acts in this way: Instead of radiation from the incubator supplying heat to the eggs, there is an emanation of animal heat from them. In other words, the embryos are giving off heat and are maintaining the registration on the thermometer at a false standard. The effect, of course, is that instead of a progressive development of the strength of the embryos, they are being weakened by the loss of their own heat. Many cases of "dead in the shell" result from this condition.

An Infertile Egg.

A Fertile Egg, showing embryonic development at seven days.

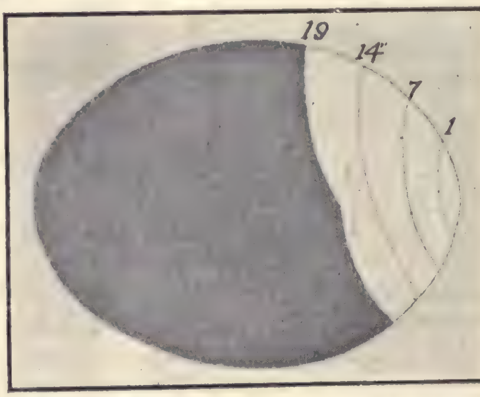
## Testing Eggs for Fertility.

Testing eggs for fertility, while perhaps one of the most simple operations that the novice poultry-keeper must learn, is yet of some importance, and many cases come under notice where mistakes are made in testing-out the infertile eggs, so much so that many, rather than run the risk of throwing out valuable eggs, refrain from testing altogether, with the



Embryonic development at fourteen days. Nearly all opaque.

result that incubator or hen space is crowded throughout the batch. Not only so, but in regard to incubators the fact of a number of infertile eggs being left in the machine is more or less prejudicial to the best results being obtained from the fertilised ones, owing to the fact that the infertile eggs lack the animal heat that is present in those eggs in which embryonic development is progressing. The ill effects of this will be in proportion to the number of infertiles left in the machines, on account of these eggs losing heat more rapidly during turning and cooling operations, and taking much longer to regain anything approaching the normal heat required after being returned to the incubator.




Embryonic development as seen at nineteen days, quite opaque except for the air space marked 1 to 19 days.

Skilled operators can test their eggs at from four to five days with a good tester (particularly in the case of white-shelled ones), but the novice will do well to leave his testing until the seventh day, but not later, because at that time it is much easier to test than either before or after.

In order to assist the novice in the testing of eggs under incubation, illustrations have been prepared of eggs both fresh and in different stages of development, as they are seen in the ordinary egg-tester before a strong light. In a medium or poor light the embryo is seen only as a dark or opaque substance occupying portion of the space of the egg, the remainder being clear in the early stages.

Egg showing a broken yolk. This will not produce a living chicken even though some embryonic development may have taken place.

# Orchard Notes.

## May.

W. J. ALLEN and S. A. HOGG.

If the land intended for planting this season is not already ploughed and subsoiled, the work should be done at once, so that the planting of deciduous trees may be completed during the month of June. The roots of young deciduous trees, if examined, will be found to be making growth during June and July, and if planting is carried out early in the winter this root growth enables the trees to obtain a good hold of the soil, and they make a strong top growth right from the time they commence to grow in the spring.

The selection of varieties to be planted should be made at once, and the order placed with the nursery without delay, if that has not already been done. In selecting, ascertain which varieties sell most readily on the markets, and then select those most suitable for the soil and climate.

### Fencing.

The orchard should be securely fenced in order to protect it from damage by stock. Where rabbits and hares are prevalent, wire netting will be necessary. This should be sunk in the ground to a depth of 6 inches, it should not be less than three feet high, and the mesh should not be larger than 1¼ inch. All gates should shut closely. Even with these precautions a constant watch should be kept for any rabbits or hares that may get inside the fences, so that they can be destroyed before they damage the trees.

### Pruning.

If this work is pushed through early, the winter ploughing can be proceeded with in good time, and it will be possible to pay full attention to the early spring spraying.

When pruning the peach it should be remembered that it chiefly crops on the previous year's laterals, and not on old spurs; thus it is necessary to keep up a yearly supply of young laterals. This can be done if the old laterals are taken out regularly each winter pruning; young laterals will then start from the dormant buds at their bases. Care should be taken when cutting out the old laterals not to cut close enough to damage the dormant buds. In a season when there is a bad showing of fruit buds, it will be necessary to leave some of the two-year-old laterals that are carrying sub-laterals, or temporary spurs showing such buds, but this is to be avoided as much as possible, for the longer the laterals are allowed to remain after the second year the harder it is for the dormant buds at the base to start into growth. If the trees have been topped the previous pruning, it will probably be necessary for a number of leaders to be thinned out this season, for if the top is allowed to become too thick the trees will not readily furnish fresh laterals along the

main branches. It has also been found that in very vigorous trees that have their shape well established, it is well only to thin the leaders out and not to top them back for a season. This non-topping also encourages the furnishing of laterals below.

The apricot crops both on the previous year's laterals and on older spurs, but on most varieties the tendency is for these spurs to die out after two or three seasons, starting from the base of the lateral; consequently the laterals soon only produce fruit towards their tips. This may be avoided by following a system of renewal very similar to that described for the peach.

Plums, on the other hand, mostly develop permanent fruiting spurs. These can generally be obtained by leaving the laterals long in the trees, and shortening them back in later years when the spurs are established and the trees are making less growth. In older trees where spurs have multiplied too numerously they should be thinned out in order to prevent oversetting and consequent small fruit; exhausted spurs should also be removed to encourage the growth of new spurs or laterals which will subsequently form fresh spurs.

Wraps on buds, either in nursery stock or old trees, may now be removed.

### The Control of Pests.

Woolly aphis generally gets ahead of the orchardist during the busy part of the fruit season, when it is almost impossible to attend to it. In these cases the trees should be sprayed as soon as the crop is gathered. A high pressure spray should be used and the nozzle held very close to the affected parts of the tree. When spraying in this manner a large quantity of spray is used, and on big trees quite a pool of mixture will accumulate at the base of the tree by the time the spraying is completed. For this reason it is safer at this time of the year to use a tobacco wash, rather than an oil spray, to deal with this pest.

Although the apple and pear crop may be harvested, the codlin moth bandages should be kept on the trees. Many grubs will be found sheltering in the bandages, having been driven out of other hiding places by the cold weather and winter rains.

In citrus orchards situated in localities where fruit fly has been bad during the summer, kerosene traps should be hung on the sunny sides of the trees. Two-pound jam tins cut down to a depth of 2½ inches, and fitted with wire handles, make good traps, and do not spill as readily as flat tins like sardine tins. All fallen fruit should be regularly picked up and destroyed by either burning or boiling.

### Harvesting.

In the tableland districts there will still be late varieties of apples, such as Yates and Granny Smith, to harvest.

The winter crop of passion fruit will be coming in this month. The fruit should be regularly picked as it reaches a uniform black colour.

# Agricultural Bureau of New South Wales.

## Suggested Subjects for Bureau Meetings.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case, one of the following paragraphs may provoke a useful discussion :—

*Do you think you could improve your potato crop by selecting the best yielding roots before digging, with a view to sowing a stud plot to provide seed of better strain for the future ?—What characters would you select for, or would you only consider the yield ?*

*Is the rugging of cows in winter a practice that commends itself to you ? If you have had any experience with it, what advantage has it in relation to (1) the general condition of the animal and (2) the maintenance of milk production ? Do you remove the rugs in the daytime, and do you think the results are any better where that is done ?*

*What methods do you find most successful for storing maize ?*

*When do you start preparations for the planting of young trees, and why ? What month do you prefer for planting out deciduous trees ?*

*When do you apply lime in the orchard, and how much per acre do you use ? What do you find the minimum quantity that gives the best results?*

*Is there any local co-operative movement in your district ? If not, is there any chance of starting one, and what line could be taken with greatest advantage ? What capital would be required and how could it be raised ? Have you ever considered the formation of a small credit or financing institution ?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, it is pointed out that the Department does not necessarily endorse the opinions expressed.*

### Bimbaya.

"Should the number of live stock on the farm be increased or decreased, and in what direction—sheep or cattle or pigs, and why" was the subject for discussion at the monthly meeting of this branch held on 25th March.

Several members contended that the district was "cow sick" and required a change. It was thought that if sheep were put on for a time the change would be beneficial. Others thought that fewer and better cows, combined with a larger number of pigs, would be more remunerative. Smaller paddocks, so that the sheep or cattle could be shifted frequently from one to another, found much favour. Systematic testing and culling of the dairy herds was advocated as a means of obtaining greater returns from a smaller number of cows.

### Blacktown.

The annual meeting of the members of this branch was held on 23rd March, when the following gentlemen were appointed office-bearers for the ensuing year :—Chairman, Mr. Frederick L. Parker; Vice-chairman, Mr. Charles R. Webb; Treasurer, Mr. William G. Harper; Hon. Secretary, Mr. Robert H. Lalor. Two new members were elected.

Messrs. Frederick L. Parker and R. H. Lalor were elected delegates to the Royal Agricultural Society's Conference, and to the Flying Fox Conference.

Regarding the circular issued by the Kellyville branch in connection with the orchard tax, it was decided to let the matter stand over until further information was available.

It was decided to apply to the Agricultural Department for lectures on grapes, clearing by explosives, and the horse.

### Cordeaux-Goondarin.

The monthly meeting of the members of this branch was held on 25th March, when fifteen members were present. After the general business had been disposed of, an address was given by Mr. A. Boot, Secretary of the New South Wales Fruitgrowers' Association, outlining the aims of the Association, and pointing out the benefits to be derived from it. Mr. Boot was subjected to a good deal of questioning. The subject of forming a branch was left for a future meeting. The proposed Flying Fox Conference was also discussed.

### Glenorie.

A meeting of the members of this branch was held on 28th February, when six new members were nominated. A discussion took place on the honey locust tree for shade and food for pigs—a subject suggested by an article by the Principal of Hawkesbury Agricultural College in the February "Gazette," and the receipt from the author of seeds of the tree for distribution among members. The discussion provoked a profitable exchange of opinions.

### Kellyville.

A very interesting debate took place at the meeting of this branch held on 10th April, twenty-five members being present. The subject discussed was whether it is more beneficial to work a summer fruit orchard in the fall of the season, or to leave it till the early spring.

### Lidcombe.

A well-attended meeting of this branch was held on 8th March, when Mr. E. N. Ward, Superintendent, Botanic Gardens, Sydney, delivered an interesting lecture on the use of fertilisers in the garden.

Mr. Ward stated that before the application of artificial manures the ground should be thoroughly worked, either by trenching or by subsoiling with the plough, thus creating a better water table. The best manuring of all was the adding of humus to the soil in some form or other, the most popular being thoroughly decomposed farmyard manure—not to be confused with the dry street sweepings of a big city. The next best method of applying humus was through decomposed vegetable matter. He advocated the use of a humus pit in every garden. A further method was the digging or ploughing in of some green crop—the method known as green manuring.

Mr. Ward then described the use of artificial manures, explaining that in their use there was a danger of feeding the soil and not the crop. The proper use of chemical manures was then explained, particularly the correct time to apply them, that is, when the crop or plant mostly required this class of food or stimulant.

The feeding of sweet peas, from sowing to the exhibition table, was discussed, also the proper feeding of dahlias, chrysanthemums, roses, bouvardias, tomatoes, legumes, and the Brassica family. The lecturer finally outlined the administration of a well conducted flower show.

The usual monthly meeting of the members of this branch was held on 23rd March, when, after the disposal of the general business, arrangements for the show were discussed. Twenty-four members were present.

A meeting was held on 6th April, when twenty-eight members attended. After the general business had been disposed of a discussion took place on cauliflowers.

The autumn annual show of the branch was held on 10th April, and was in every way a success. The exhibit staged by the Department was described as an excellent one and very much appreciated. A district exhibit from Fairfield West, with some other non-competitive features, and the competition sections, made a fine display.

### Lisarow.

At the meeting held on 7th February, a discussion took place in regard to obtaining improved railway facilities and the collection of orders for sugar for jam making.

The Lisarow district exhibit secured second place at Gosford show, scoring 226 points to 231 by the winner, and obtaining highest points in the fruit section—66 out of a possible 70.

The meeting held on 6th March was devoted to a discussion of co-operative buying. It was decided to deal further with the matter.

### Lower Portland.

A meeting of this branch was held on 1st March, when twenty-two members and a number of visitors listened to a valuable lecture by Mr. C. L. O'Gorman, a veterinary officer of the Stock Branch.

Dealing with the subject of the farm horse, Mr. O'Gorman discussed its various common affections. He impressed upon members the importance of not breeding from unsound stallions, as many of the troubles were hereditary. It was the intention of the Government not only to enforce the regulations dealing with unsound stallions but, if necessary, to increase their stringency. In discussing the different ailments, the lecturer considerably assisted his hearers' appreciation of his points by diagrams drawn on a blackboard. He finally answered a number of questions. A hearty vote of thanks was accorded him.

### March.

An interesting lecture was delivered by Mr. W. W. Froggatt, Government Entomologist, on insect pests in the orchard, on 24th February, under the auspices of this branch.

The usual monthly meeting of the members of the branch was held on 22nd March, when the evening was devoted to the discussion of general business.

### Matcham.

Members of this branch met on 28th February, when a discussion on woolly aphis and its remedies was introduced by Mr. Auldridge. Mr. J. Anderson opened the discussion. As an apple grower for a number of years, he expressed the opinion that with care and attention much could be done to protect and clear the trees of the trouble by spraying with red oil at leaf fall, and then a little later with a concentrated tobacco extract. Pruning was also a help; the old wood and knots and matter carrying the aphis should be removed where possible without injury to the tree. At times kerosene emulsion was effective.

Mr. Crossland endorsed the previous speaker's remarks and said he had seen good results from this treatment. Mr. Mills said he had treated his trees with half kerosene and half castor oil and had got good results but, being a slow process, this would only apply to small areas, though it was worth a trial.

Mr. Macinante, a successful apple grower of this district, said he had found cultivation as well as spraying a great help to trees affected by this troublesome pest. He found that if tobacco stems were soaked and a little soap powder mixed with kerosene were added, the mixture had a good effect; but regretted that, while the real orchardist was doing his best to combat these pests, careless persons who did not depend upon fruit-growing for a living were allowing their trees to breed aphis by millions. This created much trouble and caused extra expense for spray material, labour and loss of fruit, which meant reduced profit to the grower.

Departmental Note.—The Department prefers to clean the trees with a strong concentrated tobacco extract and then later to use miscible oil if necessary. It should be clearly pointed out that the mixture of kerosene and castor oil should not be used as a spray but just painted on affected parts. It should not be allowed to run down the bark.

### Middle Dural.

A meeting of the members of this branch was held on 5th March, when Mr. C. W. Roughley submitted a report of an analysis conducted by the Chemist of the Department of Agriculture on various brands of lime-sulphur. A lengthy discussion followed on the unsatisfactory results shown by the analyses, and it was unanimously agreed that, providing the Department's formula was used, together with a Baumé hydrometer, a very much more satisfactory article than some of the lines on the market could be made by growers themselves.

### Milbrulong.

A meeting of forty-five members of this branch was held on 8th March, when a discussion took place on co-operative buying, and it was unanimously decided to move in the matter. An executive committee of nine members was elected to carry out the co-operative business of the branch. Members intend to carry out the business on a strictly cash basis, and an order for goods valued at £400 was sent away.

There is now a membership of this branch of 108.

### Nimbin.

The annual meeting of this branch was presided over by the chairman, Mr. R. Gall. The report submitted reflected an active and satisfactory year. The helpful co-operation of the Department in the activities of the branch was appreciatively mentioned. A slight increase in membership over the previous year was shown and a credit balance reported by the treasurer.

### Quaker's Hill.

The monthly meeting of the members of this branch was held on 3rd April, when a fair number of members were present. The main business of the meeting consisted in reading the literature on stinkwort forwarded by the Department. It was decided to ask the Shire Council to proclaim it a noxious weed. The branch has already requested the Council to proclaim blackthorn a noxious shrub, as this was the means of maintaining many citrus pests. A protest against the imposition of the orchard tax was raised.

### Stratford.

A meeting of this branch was held on 6th March. The evening was taken up in making final arrangements for the staging of the branch's exhibit at the Gloucester show.

### Tingha.

The event of greatest interest to members during the last few weeks was the second annual exhibition, held under the auspices of the branch. "Two years of drought have utterly failed to bring Tingha to its knees," remarked a local paper enthusiastically commenting on the exhibits. Certainly the fruit, vegetable and other sections seemed to belie the fact of the prolonged dry spell suffered by the district. All members worked well for the success of the show, which was officially opened by Mr. Ditzell, chairman of the Inverell branch.

### Toronto.

At the monthly meeting of this branch held on 3rd February eight new members were enrolled. It was announced that the recent show was a success, and it was decided to write a letter of thanks to the judges and to the Department of Agriculture for their assistance.

At the meeting held on 3rd March it was stated that the membership roll had now reached fifty. Mr. Filmer gave a demonstration of citrus budding, showing several modes on nursery stock and advanced trees.

### Wellington.

A valuable paper by Mr. E. G. Salter on the subject of wheat-breeding was read at the March meeting of this branch. Parallels were drawn with a number of other plants and many interesting points were explained. A summary of the paper will appear next month.

### Wetherill Park.

A lecture on fodder crops was delivered by Mr. B. C. Meek, Assistant Inspector of Agriculture, under the auspices of this branch, on 22nd March. Members were given many useful points on the preparation and manuring of the soil for different crops, lucerne and Sudan grass being particularly interestingly dealt with. There were some forty farmers present and many questions were put to Mr. Meek and fully answered.

### Yarramalong.

The meeting of this branch held on 3rd March and attended by ten members was devoted to a general discussion on the report of the potato experiment plots. It was stated that over 4 inches of rain fell in November in a few days, doing a considerable amount more harm than good. The plots throughout were absolutely free from disease, the sample of tubers dug being very good—considerably better than in the previous year. The price realised was £18 per ton.

### Yarrunga and Avoca.

A general meeting of this branch was held on 10th April. After the general business had been transacted, it was decided to ask the Department for an expert to give a demonstration and lantern lecture on the common diseases of dairy cattle at an early date. A programme was drawn up for the meetings of the branch for the year.

## AGRICULTURAL SOCIETIES' SHOWS.

**Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.**

### 1920.

| Society. | Secretary. | Date. |
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| Nimbin A. and I. Society | B. R. Southwell | May 12, 13 |
| Corowa P., A., and H. Society | J. D. Fraser | Aug. 17, 18 |
| Parkes P., A., and H. Association | G. W. Seaborn | ,, 18, 19 |
| Forbes P., A., and H. Association | E. A. Austen | ,, 23, 24 |
| Murrumbidgee P. and A. Association (Wagga) | A. F. D. White | ,, 24, 25, 26 |
| Lockhart A. and P. Society | E. D. Arnold | ,, 31, and Sept. 1 |
| Albury and Border P., A., and H. Society | A. G. Young | Sept. 7, 8, 9 |
| Young P. and A. Association | T. A. Tester | ,, 7, 8, 9 |
| Cowra P., A., and H. Association | E. P. Todhunter | ,, 14, 15 |
| Ganmain A. and P. Association | T. S. Henderson | ,, 14, 15 |
| Cootamundra A., P., H., and I. Association | N. Gardner | ,, 15, 16 |
| Northern A. Society (Singleton) | J. T. McMahon | ,, 15, 16, 17 |
| Narrandera P. and A. Association | W. H. Canton | ,, 21, 22 |
| Temora P., A., H., and I. Association | A. D. Ness | ,, 21, 22, 23 |
| Junee P., A., and I. Association | T. C. Humphreys | ,, 28, 29 |
| Holbrook P., A., and H. Society | J. S. Stewart | ,, 28, 29 |
| Deniliquin P. and A. Society | P. Fagan | ,, 29 |

### 1921.

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| Kiama A. Society | G. A. Somerville | Jan. 25, 26 |
| Guyra P., A., and H. Association | P. N. Stevenson | Feb. 16, 17, 18 |
| Glen Innes P. and A. Society | Geo. A. Priest | March 8, 9, 10 |
| Upper Hunter P. and A. Association | R. C. Sawkins | ,, 16, 17 |

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*Vol. XXXI. Part 6.* *JUNE 2, 1920.*

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# AGRICULTURAL GAZETTE

. . OF . .

# NEW SOUTH WALES

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VOL. XXXI. PART 6. JUNE 2, 1920.

*Agricultural Gazette of New South Wales.*

# Lucerne on the Coast.

## The Central Coastal Districts.

J. M. PITT, Assistant Inspector of Agriculture.

ALTHOUGH lucerne adapts itself remarkably well to various climates and a wide range of soils, the conditions are hardly anywhere more suitable for its growth than in the northern coastal districts of our State. The alluvial soils bordering the rivers in this region are deep and fertile, and as there is a growing season of at least six months and a rainfall ranging between 35 and 60 inches, nothing much better could be desired. The expansive rich flat lands spreading for miles along each side of the Hunter River have long ago earned fame for the enormous output of prime hay, and seed of the Hunter River strain—a broad-leafed, upright growing, early maturing variety—has been distributed far and wide. The rainfall in this district averages slightly over 30 inches, and as atmospheric conditions are less humid than in districts further north, growing for hay is carried out more extensively than perhaps any other agricultural pursuit.

Along the Manning River lucerne growing is not carried on to nearly the same extent, and although the growth in this region is, on the whole, more luxurious than along the Hunter, the greater annual rainfall (chiefly covering the growing period) and the more humid conditions interfere considerably with hay-making operations, especially in the early and late portions of the season. Most of the fields, in consequence, are cut as green fodder for cattle—dairying being the chief pursuit.

Further north, along the Hastings and Macleay, lucerne growing has made even less headway, and it is surprising, considering the strides that dairying has made, that lucerne—probably the greatest of all fodder crops—should receive so little attention. The farmers are so well provided for by natural pastures that they follow the line of least resistance and allow nature to do the providing, which unfortunately it does not always do.

The districts north of the Hunter have not had the best facilities in the past for marketing lucerne, bar-bound rivers making exporting by that means unreliable. Consequently dairying and maize growing gained the upper hand, but now that these districts have been provided with rail transit, marketing has been made more rapid and reliable.

It is not so many years ago that fields ranging in age from 12 to 20 years and over were quite common, but now-a-days such old-established beds are few and far between, the profitable life averaging from 4 to 7 years. Many suggestions have been discussed as to the reason or reasons for this. Some farmers are convinced that the seed procurable of later years is far inferior to

that of olden times; others agree that the drier seasons, and sowing on areas the humus of which has been leached out by overcropping are partly the cause. Poor cultural preparatory methods, sowing at the wrong season and on dirty land, have certainly caused many failures. Cutting too short or too young, grazing off too early or too constantly, and a total ignorance of the handling of the crop, have ruined fields in less than three seasons in several instances.

Lucerne is not a difficult crop to grow successfully when properly understood, but the observance of certain points is imperative.

A good deep soil is most essential, for lucerne is a gross feeder, and the power it has of penetrating deeply into the lower strata not only gives it a more extensive feeding area, but also enables it to draw moisture from lower sources and thus help to ward off the ill effects of dry spells. Deep alluvial soils, too, are usually well drained, and this is essential, for nothing kills out lucerne quicker than standing water, especially during hot weather.

Too little attention is paid to the selection of the site. In many instances lucerne is sown on land that is practically devoid of humus, owing to injudicious over-cropping. The plot must be rich in humus, and where it is not present in large enough quantities it should first of all be increased by the growth of suitable green manure crops and rotations. New alluvial land recently broken up, or paddocks under pasture for a number of years are most suitable, but the latter should be thoroughly cleaned of weed growth beforehand.

It will be seen that cultural operations that aim at the increase of the humus content, the conservation of moisture, the destruction of weeds, and lastly a perfect seed-bed, should be commenced at least twelve months prior to sowing.

Where autumn sowing is practised, the land should, where possible, be broken up the previous autumn, fallowed during the winter, and a drill-crop, such as potatoes or early maize, sown during the spring. The cultivation applied to this crop plays an important part in the destruction of weeds. An alternative is to sow a straw or green manure crop in the autumn, plough under in the spring, and then by fallowing and working the fallow destroy the weed growth and conserve moisture until the land is ready to prepare for sowing.

A good seed-bed is most essential. It should be firm and settled, with the top few inches in a fairly fine tilth. Many failures have been caused by having the seed-bed too loose.

A deep ploughing may be given a month or six weeks prior to sowing, followed by light workings to firm the soil down, and at the same time to check weeds and conserve moisture. If weeds be present, or if the surface has become too firm, a very shallow skim-ploughing may be given a few days before sowing, followed by workings with suitable implements to get the desired seed-bed.

Autumn sowing is usually practised on the coast, April, May, and June being the most popular months. The advantages of sowing then are that the plants become well established during the winter, and are better able to withstand the trying conditions during the hotter months of the year than

when spring-sown. Further, should weeds be troublesome, the stand will be sufficiently advanced to cut, and thus prevent them seeding. Spring sowings, unless made very early and with other conditions suitable, are somewhat risky.

So many failures have been caused through sowing inferior seed that it is almost useless to proceed except with the best procurable.

Owing to the fertility of the soil, unless the seeding is made heavy—from 15 lb. to 20 lb., and even more—growth becomes too luxuriant, and thick stalks are the rule. The seed is sown on either a rolled or harrowed surface, both having their advocates, but a rolled surface is usually left after covering. This compacts the soil round the seed, and crushes any clods. Sowings are made by hand, half the seed being broadcasted in one direction and the remainder at right angles, the object being to ensure an even seeding. Very few mechanical "sowers" are to be found on the coast. Farmers are adepts at hand-sowing, the "patent" probably having been handed down from older generations.

With autumn sowing, the first cutting is usually ready about August or early September. A good indication is to observe the buds at the base of the stems. When these are sprouting the crop is ready for mowing. Should weeds be troublesome the mowing may be started earlier. Another useful guide is when the blooms are appearing, but the former method is to be preferred, being safer and better, because often in good seasons the young growth commences before the blooms appear, and to cut the tender buds injures the next crop.

The first cutting should be made about 3 or 4 inches from the ground as a safeguard against "bleeding" the young plants. In subsequent mowings cut lower.

Curing depends mainly upon weather conditions and the heaviness of the crop. Under ordinary circumstances, where hay is mown in the morning, raking may be commenced during the afternoon, and the cocking may be done next day. No hard and fast rules can be laid down, but the farmer soon learns from experience.

Good-coloured leafy hay is necessary for prime quality. To leave it too long in the swath or windrow results in loss of leaf, while if it is carted in too moist it becomes brown in colour or mouldy, and inferior in quality.

Most lucerne growers do not graze their fields under any consideration, but along the Manning River most of the farmers who are dairying utilise at least three of the crops in each season for grazing or as green fodder, reserving for hay only such growth as occurs when ample feed of other descriptions is available.

Unless extreme caution be taken there is always a risk of hoven or "blowing" if the growth is too immature or the cattle are left on it for too long a period.

Experiments with top-dressing lucerne have proved beyond doubt that an application of 2 cwt. of superphosphate on a well-established field has a most

beneficial effect. The excellent results obtained from the Department's plots are being largely availed of by lucerne growers with remarkable results. In many instances increases in yield of over 60 per cent. over the non-fertilised areas have been obtained with four cuts of green fodder.

Not only is there an increase in yield, but the stand is considerably thickened and the plants stool better. Weak growth is turned into vigorous growth, and for the small initial outlay, the return is highly profitable. The results are the more striking in wet seasons.

Applications of superphosphate are best made early in the spring after the paddocks have been cut and then spring-toothed or spike-harrowed.

Top-dressing is not recommended on fields badly infested with paspalum, couch, or nut grass.

## The South Coast.

R. N. MAKIN, Inspector of Agriculture.

LUCERNE growing on the South Coast has not received the attention that is due to it.

Farmers holding really good land rarely give it attention, as the pastures may generally be depended upon for nine months in the year, and the average farmer seems to be content with such conditions. The man whose holding is not so good naturally turns his attention to the production of fodder crops to supplement his pastures.

The value of lucerne for dairy stock is unquestionable. The point therefore is : "Can it be grown, and where, how, and when?"

In selecting a site for lucerne it does not always follow that the soil is unsuitable because surface indications are unfavourable. Lucerne is one of the deepest rooting of all plants; therefore, in considering the soil, one must consider more than the first six inches. The nature of the subsoil should be ascertained by means of a spade; should it be free, with no big stones or puggy clay and no stagnant water lying about in wet weather, it is worth while trying a small plot for a start. In making these investigations it is well to sink a hole at least 4 feet deep. It does not follow that if there are no river flats or valleys deep with the wash from the hills it is no use trying to grow lucerne. It has been proved that lucerne may be grown to advantage on the hill sides after it has failed on the flats, that sown on the higher ground often escaping the frost—a point that is worthy of consideration.

To establish a plot it is necessary that the ground be cleaned of troublesome weeds, such as couch, prairie, and paspalum grasses, fat hen, wire weed, wild turnip, &c. It might be specially mentioned that where nut-grass is troublesome laying down to lucerne is often a very successful method of dealing with the pest.

Many failures in lucerne growing have arisen from the ground being dirty with weed growth, the young plants being choked out in their early stages. To free a plot from weeds it is advisable to sow a couple of broadcast crops. This will allow many weed seeds to germinate and the plants to be smothered by the crop, and the cultivation in itself will germinate and kill others. Deep ploughing is not generally advised, and bringing the soil to too fine a tilth has also been found inadvisable, as the soil has then a tendency to run together and choke the little seedlings, and weed growth is encouraged; while left in a rougher state the small clods protect the young lucerne seedlings, and the subsequent harrowings are more effective.

After sowing 12 to 16 lb. per acre broadcast, the seed should be well harrowed in. Harrowing with a brush is not advised as the seed is often pulled into heaps; the lever harrow is the most serviceable. To secure the best results, sowings should be made from March to June. Spring sowings generally meet dry weather conditions and difficulty is experienced in keeping weed growth from overwhelming the young seedlings.

When the plants have attained their third pair of leaves the root development should be such that harrowing to conserve moisture and to control weed growth could be carried out without damaging the plants.

Once the plot is established the plants should be stimulated at least once a year with a dressing of superphosphate at 2 cwt. per acre. After every cut the plot should be well harrowed to keep the moisture in, to disturb any insects, and to check weed growth.

## A Novel Experiment.

Ten dairy farmers at Oxford, Pennsylvania, U.S.A., who had learnt how to produce clean milk, agreed in 1915 to visit ten other farmers in the neighbouring district of Kelton to see what kind of milk they could produce in sheds they had never before visited. Tables showing the bacterial content of the milk produced by the Oxford farmers on the Kelton farms are compared with tables showing the bacterial content of the milk produced by the Kelton farmers themselves, and demonstrate in a remarkable way the improvement which can be effected by care in milking and subsequent handling of the milk.—*Journal of the Board of Agriculture*, London.

## Superphosphate or "Basic Super."

Basic superphosphate is guaranteed to contain 20 per cent. citrate soluble phosphoric acid. Superphosphate contains 17 per cent. water soluble phosphoric acid, ½ per cent. citrate soluble, and ½ per cent. insoluble phosphoric acid.

At 10s. 6d. per bag for superphosphate, and 12s. 6d. per bag for basic, the manurial value of superphosphate is very much greater than that of basic superphosphate.—F. B. Guthrie.

## PLANTS WHICH PRODUCE INFLAMMATION OR IRRITATION OF THE SKIN.

(Previous references:—May, 1918; March, 1916.)

I DESIRE to invite attention to the irritating effects of some plants belonging to the *Moraceæ* or Moreton Bay Fig family.

An esteemed correspondent from Southern Queensland and the Tweed River has sent me specimens of *Pseudomorus Brunoniana*, with this note, dated 28th April:—"The sap causes severe irritation to the eyes. Yesterday a man suffered intense pain for about five hours—so bad that he was unable to do any work for the rest of the day. Only a small quantity splashed into the eye."

This tree is not rare from the Illawarra to Central and even Northern Queensland, and is sometimes known as the "whalebone" tree because of the toughness of its wood. It is one of the woods used by the coastal aborigines for boomerangs. The aborigines of the northern rivers of New South Wales used to give it the names of "mail" and "lagaulbie." It is also remarkable for the variation in the shape of the leaves on the same tree.

It is not a little singular that a few days before I received this report in regard to the tree in question, I should have been communicated with by a leading Sydney oculist, who informed me that a patient of his had consulted him in regard to intense irritation of the eye, and the only thing he could trace it to (yet not without an element of doubt) was the climbing fig, *Ficus stipulata*, so often found on walls and houses in the Sydney district. The patient, a gardener, believes that he rubbed his eyes with his hands after he had been working at this climbing plant.

I do not consider the matter proved, but the fact that two closely allied plants are accused of causing irritation of the eyes should put people on their guard.

It will be seen that I have, in this series of notes and articles, recorded a very large number of plants, native and others, which have caused irritation of the skin and of the eyes, and a word of caution may not be out of place: that people working amongst plants—be they in the garden, forest, farm, or station—should be on their guard against rubbing their knuckles into the corners of their eyes when they feel a tickling or irritation there. If medical aid cannot be immediately secured, the patient should very carefully wash his hands with soap, bathe the eyes in cold water, and then dab them with a weak solution of washing soda or carbonate of soda, which are practically the same thing.—J. H. MAIDEN.

## GRAZING SHEEP ON VINES.

"WILL turning sheep into a vineyard injure the vines? I am told that where they bite the vine they poison it right to the roots." The question came from a coastal district, and the Viticultural Expert's reply was a clear denial as to the poisoning, but a remark that feeding off the leaves too early interferes with the ripening of the wood for next season, and therefore weakens the vine. If there is much herbage among the vines the sheep will eat this first, and they can be removed before they damage the vines. Depasturing sheep on vines is not recommended, though under drought conditions and shortage of feed practices that are not orthodox may have to be resorted to.

# Kiln-drying Maize.

## With Notes on Heat for Controlling Weevil and Sweating in Maize and Millet.

W. B. GURNEY, Assistant Entomologist, and J. M. PITT, Assistant Inspector of Agriculture.

These notes are intended generally to indicate to farmers the value of hot-air blast conditioners or kilns for the control of weevil and for conditioning maize either for the market or for storage. They have the more particular object, however, of describing the simple structure of a home-made kiln. The kiln-drying of maize should appeal to growers, not only because it permits of the early market being caught, but because the cultivation of early varieties in certain districts, followed by early pulling, brings in its wake numerous advantages in farm practice, as will be shown later.

Before maize can be safely stored in silos, the moisture content needs to be reduced to about 14 per cent., and to even a lower percentage if it is to be tightly sealed up in tanks or other airtight receptacles.

The danger of "tanked" maize sweating is well known to farmers, the erratic results being due to the presence or absence of moisture sufficient to set up sweating. Excess moisture encourages mould and decay, and at the same time favours the rapid development of weevil and moth, which, be it remarked, are entirely different species of insects, as also a dozen or more other insects that quite commonly develop in and are destructive to stored maize. These insects all pass through the egg, grub, pupal and adult stages, and never, of course, can be spontaneously generated, so that, if maize is free from insects when sealed in insect-proof tanks, no development of these insects can occur, whether the maize is comparatively moist or comparatively dry.

Adult weevils are killed on exposure for two or three minutes to a temperature of 120 degrees Fah. Moreover, if maize is placed in layers a single grain thick and exposed for five minutes to a temperature of 171 degrees Fah., the grain is heated to 130 degrees Fah., and weevils present are destroyed. We see, therefore, that exposure for longer periods of thicker layers of maize would heat the grain sufficiently to kill any weevils present. A hot-air blast of 150 to 160 degrees Fah., and even 175 degrees for shorter periods, may be applied to maize, without much effect on germination However, maize in bulk is mostly intended for food, and smaller quantities intended for seed might be treated by heat for longer periods at lower temperatures, or else fumigated or treated with naphthaline.

As it is imperative that maize stored in closed receptacles should be dried sufficiently to prevent it sweating, it is only safe in practice to store maize that has been well air-dried by standing in the field, or that has been stored

in open bins or in sheds for periods varying from several weeks to several months, according to the season and weather conditions. Green maize cannot even be bagged with the certainty that it will not sweat, let alone be sealed up in vessels or silos. The demand for early maize leads to green maize being rushed on to the market, and sometimes sweating leads to serious losses.

The alternative to natural drying of maize, which occupies weeks or months, is to dry the grain artificially, either in kilns or else in special conditioning machines, provided with hot-air blasts to reduce the moisture content rapidly. Maize may be dried in kilns within three or four days, and in special hot-air machines within an hour or two. English and American firms have on the market various types of conditioners able to deal with 50 bushels and up to 1,000 bushels or more per hour, a hot-air blast of 140 degrees Fah. to 180 degrees Fah. being forced by fans through layers of maize spread out on racks. This means an even distribution of heat, and makes it possible to raise or lower the temperature as required, and allows the exposure of the maize to the heat to be increased or reduced as may be necessary to dry the maize and incidentally to kill most of the weevil. The cost of such conditioning machines varies from £300 to £5,000, which places them outside the reach of most farmers unless a number were to co-operate for the purchase and operation of one. With such co-operation, the establishment of plants at various centres on our river fronts, especially if supplemented by erecting silos alongside, is a sound proposition that cannot be too strongly urged upon our maize growers. With them, the grain could be treated and marketed at once, or stored in silos indefinitely for a favourable market.

However, the farmer at present seems to prefer to handle his maize himself, and as an alternative to the larger and more effective co-operative scheme we offer the particulars of home-made kilns that can be erected with wood and other material usually available on the farm, at a cost of, perhaps, £5 to £15, while firing amounts to about four or five 7-feet logs per day.

With kiln-drying, in which the direct heat from the fire is applied to the maize, we cannot hope to control or distribute the heat so evenly throughout the maize as with the specially constructed conditioners, but the method suffices to reduce the moisture (withal somewhat irregularly), and permits of green maize being bagged after three or four days in the kiln, without any danger of sweating. The quality is not affected for purposes of food for stock, even in the case of the maize nearest the fire. Where, however, a parcel of maize was so green as to be about the doughy stage, its viability was so reduced that when tested for seed purposes in three different tests, 55 per cent., 60 per cent., and 25 per cent. (or an average of 46·2 per cent.) failed to germinate.

On slightly more mature grain the effect might be less harmful to the viability. However, with care in keeping the fire glowing hot and not too fierce, even maize intended for seed may easily be treated without its germinating qualities being affected, and the farmer will then be able to tank it with safety.

The growing demand for millet seed suggests that millet heads might equally well be kiln-dried, so that the grain could be stored permanently in hermetically sealed tins or in tanks without danger of moulding and with a minimum of danger from weevil. We have been shown by Mr. V. Murray, of Pampoolah, fairly dry samples that he had kept in sealed kerosene tins for seven months. Only slight mould could be seen, and in one tin (thought to be not quite adequately sealed) were a few weevils.

## Description of a Kiln.

The photograph accompanying this article shows at a glance the main features of a kiln erected by Messrs. Andrews and Shield at Mt. George. It consists of a platform 17 feet x 13 feet carried 6 feet above the ground on

**Drying Kiln at Mt. George, on the Manning River.**

The platform on which the maize is placed is just above the heads of the figures, and the log fire is lit in the middle of the earthen floor below.

four posts. On this the husked maize cobs are stacked to a depth of about 3 feet. Surrounding the platform are 3-feet walls of horizontal boards. The floor of the platform consists of round saplings 13 feet long and about 5 inches in diameter, running diagonally; as these do not fit too closely together they allow the heat from the fire below to rise through the maize cobs. Side walls are erected between the strong corner posts that support the platform, extending

from the ground up to the platform. They consist of upright slabs, fitting closely, but allowing air to pass freely in to the fire. The fuel of the fire rests on the ground in a shallow cavity 2 feet wide, 9 inches deep, and 7 feet long, running lengthwise under the platform. The firing required per day is only about four 7-feet logs, about 9 inches in diameter, so that the firing bill is exceedingly small. The fire should not be allowed to blaze or be too fierce; slightly green ironbark logs are found to burn with little smoke and a good ember. The doorway by which the fire is stoked is about 3 feet wide, and is closed with a sheet of corrugated iron.

Above the platform that carries the maize is a corrugated iron roof, erected to protect the maize from rain during treatment, but in lieu of this a tarpaulin may be used, either laid directly on the maize or raised on posts as a temporary roof.

We have inspected various types of kiln, and certain dimensions below are given as presenting various advantages :—

*Platform.*—17 feet long, 12 feet wide, 7 feet above the ground, maize on platform, 2½ feet deep.

*Fireplace.*—8 feet long, 3 feet wide, and scooped out to a depth of 9 inches. This leaves 4 feet 6 inches between the fire and the walls on all sides. The hollow prevents logs spilling or rolling.

These dimensions would allow sixty-five to sixty-eight bags (about 200 bushels) to be treated at a time. The time required in the kiln would be about three or four days according to the greenness or moisture of the maize under treatment. Preferably four days should be allowed, as implying a slower fire and more even heating.

## Advantages of Kiln-drying.

The advantages of kiln-drying may be classified as follows :—

*The grain becomes available for market earlier.*—Maize is suitable for drying when the grain on the ears has passed from the "milky" to the "doughy" stage—usually from four to six weeks earlier than the normal harvesting period. Considering that the operation can be carried out in from three to four days, the saving in time should appeal very strongly to the farmer who is out to catch the "early worm."

*Earlier marketing means higher returns.*—The main object in kiln-drying is to place the maize on the market at a period when the highest prices are available. In normal seasons the supply of grain diminishes towards September, prices gradually increasing until the new season's supplies come to hand. It is this fact that has led the farmers of the Upper Manning (chiefly around the Woodside region) to adopt methods which have proved to be highly remunerative, more especially during the present season, when (owing to the partial failure of last season's crops, the very small wheat harvest, the shipping strikes preventing importations from other parts, and the extraordinary demand for all foodstuffs from drought-stricken districts) prices for maize have reached and maintained record heights. Kiln-drying, in consequence, has been more in evidence than for many years past. Not only have the early sown crops been treated this year, but crops sown much later, that would in ordinary seasons have been allowed to ripen naturally.

A very brief review of the market's movements should help the farmer to realise the value of early marketing. For the last seven years the highest price has been reached in January, after which values have gradually receded until April, have then remained stationary until August, and then commenced to rise again.

AVERAGE price for last seven years.

| | s. | d. | | | s. | d. | |
|---|---|---|---|---|---|---|---|
| January ... | 5 | 9 | per bushel | March ... | 5 | 5 | per bushel. |
| February ... | 5 | 8 | " | April ... | 5 | 2 | " |

In 1916 maize brought 6s. 2d. in January and fell to 5s. 5d. in February, and this year the price realised on 4th February was 10s. 6d., and on 5th March 7s.

Freshly husked maize in a condition suitable for drying contains approximately 35 to 40 per cent. of moisture, while maize barely dry enough to shell, but too soft to prevent heating, contains 20 to 25 per cent. moisture. Maize fit to keep shelled contains 10 to 15 per cent. moisture.

Maize that would be fit for kiln-drying in January (containing, say, 35 per cent. of moisture, and dried to 15 per cent. moisture) would realise 5s. 9d., which, with an 80 bushel crop, would mean a return of £23. The same crop ripening naturally, and reaching the market in March would realise 5s 2d., which would mean a loss of nearly £2 10s. per acre as compared with the January return.

*Kiln-dried maize weighs heavier than field-dried.*—One would naturally conclude that the application of artificial heat would have a detrimental effect upon the grain, especially when applied at such an immature period, but such is not the case; instead of a withered appearance, the grain retains its fullness and bright colour, and has the "rattle" so desired in the market. It is also noteworthy that the Chapman bag, which ordinarily holds 3 bushels of field-dried grain, holds slightly over $3\frac{1}{4}$ of kiln-dried—in other words, about 14 lb. extra.

To the casual observer, very little difference is noticeable in the two samples of grain, the artificially-dried perhaps having a more brittle "rattle" and a slight smoky smell, neither affecting the grain from a marketable point of view.

*The husk covering more easily removed.*—To "husk" maize when the cobs are covered with a dry, hard, tight-fitting husk is no easy operation, and to those who have experienced the difficulties this consideration should especially appeal. Usually the operations are carried out in the field when the crop is dry, the cob with the few inner layers of husk being removed from the stalk—although some farmers remove all the husk. It is necessary to have the husk removed for kiln-drying, and harvesting and husking when the crop is in a partially immature state is, therefore, distinctly less tedious than when it is in the dry state.

*Stalks and husks make useful rough fodder.*—To the farmer who combines maize-growing with either dairying or stock-raising, the husks (usually dry and unpalatable) are of some value, because they can be thrown out for the

stock to pick over. When utilised in their immature state the stalks and husks, besides being more palatable on account of their greater moisture content, contain more nutriment, and are relished to a greater extent than the drier material.

*Roughage rots quicker and more satisfactorily when turned under semi-green.*—The usual practice is to turn under the dry stalks and other rubbish with a single-furrow disc plough during the autumn, the field being left in fallow throughout the winter. To the maize-grower this method is satisfactory, for the stalks, &c., are sufficiently decomposed not to interfere with spring cultural operations.

To the farmer who grows catch crops or adopts rotations, however, the stalks cause considerable inconvenience. Cut into short lengths and ploughed under, or turned under as above, they keep the ground open or hinder other farming operations, should it be necessary to work the same portion of land again early. Cutting off and carting out means loss of time. Burning is a waste. It has been found, however, that when turned under in a semi-green state decomposition takes place rapidly.

*Land available for subsequent sowings earlier.*—One of the chief advantages of kiln-drying maize is that the land becomes available for cropping earlier than under normal conditions. This is important, for one of the farmers' main drawbacks (especially the mixed agriculturist) is want of time, and to shorten the maturing period of his maize from four to six weeks means that his autumn crops can be sown at the proper time. It is well known that to be a successful agriculturist one has to know how to do the right thing at the right time all the time.

An instance of how the Upper Manning agriculturist uses kiln-drying to advantage is shown in the manner in which he is able to remove a crop of maize and pumpkins off the land, by sowing the pumpkins whilst the maize is in the early stages of growth. Usually four or five rows of maize are sown leaving a space for the pumpkins at the ordinary distance. By the time the maize is removed the pumpkins are ready to "run," and ploughing up to the vines can then be done without any hindrance.

*Weeds controlled more easily.*—Being able to plough land earlier is a great help in the destruction of weed growth. Whilst the farmer is waiting for the maize to ripen naturally, summer grass and other summer weeds are also making growth and ripening their seed for the next season. By ploughing under before the seeds mature, a field can gradually be cleared in a large measure.

Kiln-drying at the present time is confined almost exclusively to the farmers around Charity Creek and Mt. George, Upper Manning River, several kilns having been erected in close proximity. Its adoption is strongly recommended to other districts of the coast, more especially the Macleay, which is renowned for the production of maize, and districts like the Comboyne, where the season is comparatively short. The introduction of kiln-drying to the Macleay should greatly assist in the desire of the farmers to have the maize ready for market about Christmas time.

# The Electrolytic Treatment of Seeds (Wolfryn Process) before Sowing.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S., Biologist.

THERE has been a good deal of interest in reports of the advantages of treating seeds electrically before sowing. In some cases greatly-increased yields have been claimed. The matter has recently been investigated and the experiments reviewed by the Director of the Rothamsted (Eng.) Experiment Station, Dr. Russell, who has issued his report in the Journal of the Ministry for Agriculture, Vol. XXVI, No. 10. Appended are extracts from this report. We would particularly call attention to Dr. Russell's classification of various treatments into three divisions, and to the position in which he places seed electrification as a result of a survey of the work hitherto recorded.

The late Dr. Mercier, a well-known believer in the process of seed treatment by electricity, gives the following details in his book "Manual of the Electro-chemical Treatment of Seeds":—

> The grain is placed in a solution of 2½–5 per cent. (that is 4–8 oz. to the gallon) of household salt, in a rectangular water-tight tank made of wood or cemented brick. Both ends of the tank are completely covered inside with a plate of sheet-iron about ⅛-inch thick. To each iron plate a terminal is attached for affixing the wires which conduct the electric current. A tank of the following dimensions is a convenient size in which to treat up to 12 bushels at one time, viz:—6 feet 6 inches long by 3 feet broad by 1 foot 6 inches deep (inside measurements). The solution is first prepared in the tank in the proportion of about 5 gallons to 1 bushel of grain, sufficiently well to cover the grain, which should be occasionally turned over during treatment. Oats need 5½ gallons. After the solution has been made ready in the tank, the grain is placed therein and submitted to an electric current of 8 watts per gallon of solution (400 watts for 50 gallons; *i.e.*, 2 amperes at 200 volts, or 4 amperes at 100 volts and so on). When larger quantities of grain are required to be treated at one time several tanks are connected in series, and with increased voltage the same electric current can be used through the whole series.
>
> After the treatment is completed the solution is run off and the grain removed from the tanks, and dried at a temperature of from 90 degrees to 100 degrees Fah. After the moisture has been driven out of the grain it still remains in a swollen condition, for which due allowance must be made in drilling, otherwise a smaller quantity will be sown per acre than of the corresponding untreated grain.
>
> In soil deficient in lime, a solution of 5 per cent. calcium chloride (8 oz. to the gallon) may be used instead of a solution of household salt.

"Up to the present," says Dr. Russell, "agricultural experts have not been particularly enthusiastic about the treatment, because samples of seed tested at colleges and experimental stations have in the main proved no better than untreated seed; similar results have been obtained by certain farmers who have taken the trouble to weigh up their produce. On the other hand, other farmers claim to have obtained satisfactory results, and in certain cases where the weighings were carried out by one of the assistants from the University College, Reading, there were considerable differences between crops grown from treated and from untreated seed respectively."

### Classes of Treatment.

Broadly speaking, the various methods of treating crops to increase production may be divided into three classes :—

1. Those which are nearly always successful, such as the application of sulphate of ammonia and nitrate of soda to corn* or to grass land for hay ; of superphosphate to swedes ; of salt and nitrate of soda to mangolds, &c.
2. Those which apparently succeed in some cases and fail in others
3. Those which fail altogether to give crop increases.

The use of artificial fertilisers belongs to the first category.

Methods of field trials have been devised by which an experimenter can say with comparative certainty whether or not a fertiliser or a mixture of fertilisers will yield an increased crop, given a favourable season. We cannot say this with absolute certainty, but the odds are 25 or 30 to 1 against his being wrong. While, therefore, he may make a mistake in any particular case, he will not make many mistakes in advising, say, 100 farmers.

It is comparatively easy in a short test to find whether any given process belongs to the first or second category, but it is more difficult to say whether it belongs to the second or the third. Broadly speaking, the results of the recent tests made at the colleges and experiment stations go to show that the electrolytic treatment of seed does not belong to the first category. In the majority of trials the treatment has had no effect ; in some there have been gains, in others losses. On the whole there has been nothing to indicate with certainty any increase in crop. It does not, however, follow that the process necessarily belongs to category three—the worthless class ; it may still belong to category two. A single positive result in 100 failures would put it into this class, but obviously this would require a close examination of all the alleged successes, and—which is equally important—of all the failures, before a definite decision could be given.

### Possible Cause of Successes.

Discussing the possible cause of successes, Dr. Russell says: "It may be that the successes are purely accidental ; on the other hand they may be real, and the writer is inclined to think that they are. The process consists of three parts : soaking the seed in a solution of certain salts, subjecting it while still in the solution to an electric current, then drying at 110 degrees Fah. Now it is well known that kiln-dried barley, especially after steeping, will germinate more evenly and satisfactorily than will ordinary barley. This is particularly the case if the barley contains any amount over 14 per cent. or 15 per cent. moisture. Professor Stapledon has shown that drying seed at 100 degrees Fah. may improve its germination, unless germination is already very good. Anything that helps germination may be useful on land which has been folded and left in an unfavourable condition. It is possible that the drying in the treatment might be sufficient to help

* Dr. Russell is writing of English experience, and "corn" here means small grain.

germination. Apparently in some cases the electrified seed made the better start. At Wye the young plants from the electrified seeds, both of oats and barley, at first showed greater vigour than those from untreated seed, but the superiority soon vanished. This, however, is not unusual: at Rothamsted no such difference was seen; in Professor Stapledon's germination tests, the treated seeds were not quite so good as were the untreated. Nevertheless, the occasional help to germination derived from one or other parts of the treatment may prove of value in certain field operations, and thus lead to a better crop than would otherwise ensue. It is impossible to prove a negative proposition; a few unexceptional positive results outweigh any amount of negative evidence, and would show that the treatment had some merit.

"The failure, however, of electrified seed to give any increase in yield under the carefully-controlled conditions of the experimental station trials, shows that the process lacks certainty. It cannot be compared in effectiveness with manuring, which succeeds nearly every time if properly done. The writer is not prepared on present evidence to say that the process never succeeds, but the risk of failure seems so great that the farmer should look upon it as an adventure which may or may not prove profitable."

## Mice as an Apiary Pest.

Mice are inclined to be a pest to the apiarist in some localities during the winter; not only do they damage surplus combs left accessible to them, but they even dare to enter the hive and do some damage there. In the coastal districts and in other warm localities during summer apiarists generally favour the full inch entrance, and though this entrance is in some cases somewhat contracted in preparation for the cold weather the depth is not altered. During winter the bees will form their cluster and leave a portion of the comb near the entrance unprotected, and late in the winter they are often in the super, thus leaving the whole lower body unprotected. During night time the mice go into the hive and damage the unprotected combs, often to the extent of making large holes through the breeding combs.

The first sign that mice are about is an unusual quantity of wax pieces about the entrance; if it is a bad case the wax pieces will be on the ground as well, and the bottom board and entrance will be covered. If there is evidence of the hives having been entered by mice the body should be prized up and the bottom boards cleaned; then, if the day is warm enough and it can be done without materially disturbing the cluster of bees, an examination should be made to ascertain that no mice are camped in the hive. This being done a piece of queen-excluder should be put at the entrance. A $\frac{3}{8}$-inch entrance will usually prevent the entry of mice without the excluder, but where the mice have got a start the excluder is necessary. Sometimes damage to the combs goes on and the apiarist is unaware of the trouble, for in the spring the bees rebuild the damaged comb. The common result in such cases is that an undesirable quantity of drone comb is built in, and the wax scraps left on the bottom board offer inducement and protection for wax moths. Apart from this, the work of the bees during spring is considerably hindered.—W. A. Goodacre, Senior Apiary Inspector.

## THE PRODUCTION OF MINT FOR ITS OIL.

PEPPERMINT grows most profitably on non-acid peaty soils, but if the moisture is good little trouble will be experienced even on upland soils. There is a large market in this State for both oil and dried leaves, but the crop has never been cultivated to any extent except for supplying mint for the vegetable market.

The crop is propagated from roots and runners from old plantations, and set in rows 3½ feet apart and 4 to 5 inches deep. The roots are carried in a sack over the shoulder, and are dropped into the furrow and covered by scraping the soil with the foot. One acre of old bed will provide sufficient plants for 10 to 20 acres.

Harvesting is done about the time the plant comes into bloom and before the lower leaves drop. The yield of oil is always greatest in hot, dry weather, and heavy rains at harvest time reduce the yield. On large areas the harvesting and curing are somewhat similar to haymaking. The mint may be cut with a mowing machine and allowed to lie in the swath for about a day or longer according to the weather, to allow of the evaporation of excess moisture and wilting of the leaves. The crop is placed in windrows, cocked, and then taken to the still. If the hay is fairly dry, a charge of the still (steam process) should not take longer than thirty to forty minutes, but a damp sample may require two hours.

In the United States, where the crop is extensively grown, two crops are obtained annually, though the second crop is only about half the quantity of the first cut. The conditions under which this crop is usually grown in America are cooler than ours and we should therefore produce more crops. The yield varies from 25 to 80 lb. of peppermint oil per acre, averaging about 40 lb., and about 20 lb. from the second cut. The amount of hay averages 1 to 1½ tons per acre, and if dried after distilling can be fed to farm stock. The plantations are profitable for eight or ten years.

The prevailing prices are 20s. per lb. for spearmint oil and 15s. to 18s. for peppermint. The market for the dried leaves also offers inducements to the prospective peppermint-grower. Leaves at present fetch 2s. 6d. per lb. and the normal pre-war figure ranged round 1s. 3d. The existing supply (as of other dried herbs) is considerably smaller than the demand.—A. J. PINN, Inspector of Agriculture.

## THRIFT GARDENING.

ONE way of reducing the cost of living is open to every man, woman and child who can get the use of an idle plot of ground. That way lies through the planting and cultivation of a home garden—a thrift garden. War gardens played their part in the great mobilization of resources in war time—thrift gardens now have their own big job in helping households to feed themselves.—*Weekly News Letter,* U.S. Department of Agriculture.

# Trials with Peas.

B. C. MEEK, Assistant Inspector of Agriculture.

A SERIES of tests with peas was carried out on the farm of Mr. W. P. Searr, Springside, in the Orange district. Considerable interest was displayed by members of the Springside branch of the Agricultural Bureau and, other local farmers, and several visitors from other parts of the district also inspected the plots.

While it is not advisable to rely too much on the results of one season, in this case the yields are so marked that considerable benefit should be gained by a study of the figures given.

The soil was a grey loam, one which generally gives good results from the application of fertilisers. It was fallowed over winter and worked up with cultivator and harrow to a good tilth. The seed was sown along the plough furrows by hand at the rate of 1½ bushels per acre, this method being better than drilling on account of the support the plants give one another as they spread across the furrows. When in a straight line, a strong wind will blow the whole row over to one side. As ploughed in, the rows were 2 feet 6 inches apart.

The rainfall was as follows :--November, 20 points ; December, 434 points ; January, 135 points ; total, 589 points.

THE results are given in this table.

Variety Test.

| Variety. | Maturity. | Yield per acre. |
|---|---|---|
| | days. | bushels. |
| Yorkshire Hero ... ... .. | 68 | 203 |
| American Wonder ... ... | 68 | 162½ |
| William Hirst ... ... ... | 68 | 134 |
| Hundredfold ... ... ... | 61 | 129 |
| Nottingham Defiance ... ... | 71 | 108½ |
| Daisy ... ... ... ... | 71 | 82½ |
| Stratagem ... ... ... | 71 | 80 |

The varieties were manured with 2 cwt. per acre of P7 (bonedust and superphosphate in equal parts), sown in the furrows by hand.

The three later maturing varieties had the worst of the weather, as there was no rainfall after 4th January. Nottingham Defiance showed up well nevertheless.

On account of its quick maturity, Hundredfold should be especially good for garden purposes.

LOCAL *versus* Introduced Seed.

| Seed Grown. | Manure. | Yield per acre. |
|---|---|---|
| | | bushels. |
| Local... ... ... | 2 cwt. P7 ... ... | 64 |
| New Zealand ... | 2 ,, P7 ... ... | 44 |
| ,, ,, ... | 2 ,, Superphosphate | 64 |

This experiment with the local and introduced seed was planted because it is generally accepted that locally saved seed is not worth putting in the ground.

While it may hold good for the warmer districts of the State, the test under review shows that seed saved on Mr. Scarr's farm the previous season easily out-yielded the introduced.

The soil in this case was not as good as in the variety and manurial plots.

MANURIAL Test with Yorkshire Hero.

| Manure per Acre | Maturity. | Yield per acre. |
|---|---|---|
| | days. | bushels. |
| Superphosphate. 2 cwt. ... ... ... ... ... .. | 68 | 221½ |
| P7 (superphosphate 1 cwt. and bonedust 1 cwt.), 2 cwt. | 68 | 203 |
| P8 (superphosphate 1 cwt. and blood and bone 1 cwt.), 2 cwt. | 71 | 183½ |
| P5 (superphosphate 1 cwt. and potash ¼ cwt ), 1¼ cwt. ... | 71 | 179 |
| No manure ... ... ... ... ... .. ... | 68 | 89½ |

In this trial the results show that the cheapest manure (superphosphate) gave easily the best yields, and as the cost of the manure increased the yield diminished, though even P5 gave twice as much as the no-manure plot.

## THE BOYS AND GIRLS' CLUBS.

BOYS and girls' clubs are recruited from the pupils attending the State schools, and are fostered by the Federal authorities through the county agents. The children are given elementary instruction and demonstrations in the work of pig-raising, maize-growing, &c. Competitions are held in connection with local agricultural shows. Prizes are provided by local residents and are distributed into several classes, in order that a number of contestants may have a chance to win a prize. Honor and recognition sometimes count for more than money. Badges, certificates and diplomas given to the club members are often appreciated as much as, if not more than, money and other expensive premiums. When liberal amounts are given for prizes in a county, it is thought well to give prizes to the winners of the district clubs that make the highest records with five to a team, this premium being divided into several awards, depending upon the rank. These prizes sometimes consist of a trip to one or other of the great agricultural shows, a visit to Washington, scholarships in agricultural schools, expenses necessary to a short course at an agricultural college, pure-bred pigs, pure-bred chickens, farm tools, books on live stock, &c., as well as cash prizes.—*Extract from a report* by Mr. LESLIE G. BRIDGE.

# Native and Introduced Grasses at Mount George, Manning River.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

Mr. Duncan Cameron, Mount George, has provided some very interesting and useful data in connection with the results obtained from native and introduced grasses, grown in co-operation with the Department.

Amongst the native grasses tried the most successful have been Coolah grass (*Panicum prolutum*), Native or Australian millet (*Panicum decompositum*), Warrego summer grass (*Panicum flavidum*), Queensland Blue grass (*Andropogon sericeus*), Rare Blue grass (*Andropogon intermedius*), and Brown Top or Sugar grass (*Erianthus fulvus*).

**Grass Plots at Mr. D. Cameron's, Mount George, Manning River.**
Native or Australian Millet (*Panicum decompositum*) in the foreground.

Coolah grass has won the admiration of visiting farmers on account of its drought-resistance and the remarkable rapidity of its growth. The yield of dried fodder from the plot was approximately at the rate of 8 tons per acre.

Warrego summer grass germinated well, but made much slower growth than Coolah grass. It is, however, extremely succulent and palatable, and should do well in a mixed pasture.

Native or Australian millet grows nearly as rapidly as Coolah grass, and yielded nearly as much per acre. Its wide succulent leaves make an excellent fodder and first-class hay.

Of the two blue grasses, Rare Blue grass was easily the quicker grower, but it proved inferior in palatability and succulence to Queensland Blue grass. The latter yielded approximately at the rate of 3 tons of dry fodder per acre.

A satisfactory feature in connection with the native grasses was the good germination of the seed, Warrego summer grass and Native millet being best in this respect.

The most successful of the introduced grasses were *Phalaris bulbosa*, Giant Fescue (*Festuca arundinacea*), Texas grass (*Panicum bulbosum*), Para grass (*Panicum muticum*), Rhodes grass (*Chloris gayana*) Kikuyu grass (*Pennis tum longistylum*), and Elephant grass (*Pennisetum purpureum*).

*Phalaris bulbosa* has proved the best winter grass that has ever been grown on the Manning, producing excellent succulent feed right throughout the cold months of the year.

Kikuyu grass has made wonderful growth since the roots were first planted, and is smothering everything with which it comes in contact. It possesses long spreading runners, which readily root at the joints. Somewhat like Rhodes grass in its spreading habit, its leaves are of a much softer texture, and will probably be preferred by farmers to the well-known Rhodes.

Para grass also spreads rapidly, some of the runners being over 12 feet long.

Amongst the clovers tried, Chilean clover has produced excellent results, growing to a height of 3 feet and seeding heavily.

Shearman's clover is also proving promising, and is spreading through the other herbage.

Some difficulty was encountered in obtaining a germination with Bokhara clover, but the plants which have grown are fully 5 feet in diameter and 4 feet high.

Nearly all the grasses and clovers grown are new to this district, and Mr. Cameron has been instrumental in arousing the interest of a number of neighbouring farmers in the plots grown on his property.

## Elephant and Para Grass on the Manning River.

Mr. John A. Sauzier, Bohnock, Manning River, writes:—The Elephant grass purchased from your Department two years ago gave half an acre of plants for planting on 1st September, 1919; and during this terrible drought they grew as if they were in the best of showery weather, and had attained a height of $7\frac{1}{2}$ feet in January, 1920. The fodder was then cut and, in combination with maize and sorghum, was made into stack silage. The 2s. worth of Para grass purchased from your Department gave enough plants and cuttings for planting half an acre on 1st October, 1919. It has now covered the ground with runners 8 feet long. Had I known the nature of the grass I would have planted an acre with the same quantity. I planted it 4 feet apart, whereas it would have sufficed at 15 feet apart. It has not yet given upright shoots, but is still running.

# The Utilisation of Reclaimed Swamp Land.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

MANY areas of swamp land on the North Coast have now been drained and reclaimed for dairying and agriculture, and as such lands require somewhat different treatment from other soils in the vicinity for the best results, a discussion of methods will be of interest to many who have this class of land to deal with.

In general character the soil on this swamp land is of a peaty nature, varying in depth from 6 inches to a foot or more, underlain usually by a sour clay subsoil. The peaty soil is of a light spongy type, dark in colour, and containing abundant nitrogen (sometimes 1 or more per cent.), but comparatively poor in lime, phosphoric acid, and potash. The soil gives a very strongly acid reaction, has a very high water-holding capacity, and an excellent capillary power.

The subsoil, though usually stiff bluish clay, weathers down fairly well when ploughed up a little at a time, and in this way also renders the peaty surface soil of better mechanical composition, especially after the addition of lime.

On the fringe of the swamp proper is usually a belt of tea-trees, and above this is rising ground, with soil of sandstone formation of moderate depth, which can in many cases be well utilised for some cultivation provided care is exercised in the system of cropping.

### Vegetation on Swamp Land.

Before drainage, the swamp land is covered with a growth of rushes and sedges, with coarse grasses, clearly indicating the intense sourness of the land. After the main drain has been constructed through the area, a good deal of this growth disappears, and couch and paspalum readily extend over the land if encouraged, and make good growth. For many years after draining, however, there is practically no sign of clover under natural conditions, and it is very doubtful whether it would make any stand if attempted at that early stage. This is chiefly due to the still too sour state of the land, which some individual attempt must be made on the farm to remove or alleviate.

Without improvement, the pastures on this swamp land, though abundant, are by no means satisfactory for milk production. It is known that for dry cows or for beef cattle this pasture is better, at least serving to keep such stock in fair condition. Dairy cows in milk, however, will be unproductive on such land unless fed some concentrates, such as bran, linseed meal, or oil cake, and probably also bone meal to supply lime and phosphates, which are particularly lacking in the soil, as evidenced by the bone-chewing habits of the cattle.

### Improvement of the Swamp Land Pasture.

The first step in the improvement of the pasture on such swamp land is the encouragement of sweet grasses and of clovers. There does not seem any doubt that *Paspalum dilatatum* cannot be improved on as a summer pasture on this soil. This grass will stand the wet conditions that obtain, and thrives luxuriantly. It should, therefore, be seeded and encouraged without much delay on practically the whole area after the cutting of the main drain. During the first few years the land is best utilised for keeping dry cattle, steers, or bullocks in condition. Dairying is hardly worth attempting until the land has sweetened considerably. To effect this sweetening more quickly it is essential that an application of lime should be made at once. Freshly slaked lime or agricultural lime at the rate of 1 to 2 tons per acre should be used for this purpose. This application will require repeating every few years until the sourness has almost disappeared.

When the paspalum pasture has become thoroughly established the sweetening effect may be hastened by ploughing every few years. This ploughing should be carried out with a view to bringing up a little of the subsoil for aeration and admixture with the surface peat soil, and also for renovation of the pasture. The subsequent limings can be conveniently made after these ploughings for the best effect. Except under such treatment the land cannot but be expected to remain in a sour state for many years.

The encouragement of clovers is particularly desirable, and so far the ordinary white clover has been found to be the best for inclusion in paspalum pastures. Without the sweetening of the soil by liming, however, it is useless to attempt clovers. Alsike clover is reported to be largely grown on and very suitable for muck and peat lands on drained swamps in America—being more resistant to acid conditions than any other clover. Comparatively little success has been obtained from this clover in this State under any conditions, but it is certainly worth a trial on the class of land under consideration. Shearman's clover (described in the *Agricultural Gazette* for April), which is particularly suited to the low-lying salt-marsh soils at Fullerton Cove (near Newcastle), may prove a valuable acquisition on these drained swamps. Red clover in any of its forms (including cowgrass) is more intolerant of an acid or sour soil than any of the clovers.

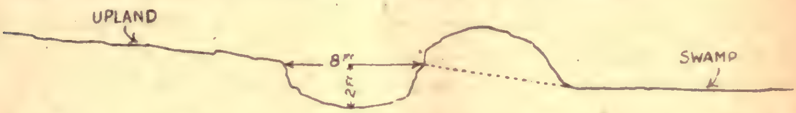
For winter or early spring pasture, a small paddock of perennial rye grass, cocksfoot, prairie grass, and alsike clover is worth trial, to see if it will withstand the conditions, but in a pasture separate from the paspalum. When depending on pasture so much, more care should be exercised in its treatment, such as the periodical resting or shutting up of the paddocks. This can only be accomplished by the employment of smaller subdivision paddocks, cheap rough fencing for which can be made from the tea-tree saplings usually found on the edge of the swamp. The upland pasture mainly consists of couch grass, with which white clover should also be encouraged by artificial distribution if necessary. It is only with the sweetening of the swamp land pasture and the encouragement of clovers that the milk-failing and bone-chewing habits of the dairy cows can be expected to disappear.

### Improving the Drainage.

It must not be supposed that the main drain through the swamp areas is to effect all the drainage necessary. Much assistance must be given, in most cases, on the individual farms by the cutting of headland drains and shallow open drains across paddocks at intervals of about a chain on the swamp land —all in a system connected with laterals which pour into the main drain.

In many cases these lands are still subject to a little overflow from the surrounding high land after heavy rains, and where this is the case consideration should be given to its prevention by the construction of small drains round the edge of the swamp.

The accompanying sketch shows the type of drain suggested.




It should be made about 8 feet wide and 2 or 3 feet deep with a mound built up (with the earth removed) on the swamp side of the drain. The construction of the drain in this form renders its fencing off from stock unnecessary, and it will be found to be very efficient in preventing overflow from the hill lands. Such a drain should be constructed, for best results, by co-operation between the individual farmers on the subdivision areas, or by the company or person owning the land, so as to get the required fall and outlet.

It is important to facilitate the drainage on the individual farm for the benefit of cultivation, for with the comparatively high prices of such land, (due, in many cases, to the cost of the drainage scheme) and with its possibilities under proper treatment, its use for pasturage alone cannot be considered highly profitable, and special efforts should be made to use the land for the growth of such cultivated fodder crops as it may be particularly suitable for.

### Cultivation on Swamp Land.

Still further sweetening of the land and assistance to drainage is required for cultivation, and to effect these conditions special methods are advisable. Some difficulty is usually experienced in properly ploughing this land, and the type of plough recommended is one with a long mouldboard, which will be more effective in turning the furrow-slice owing to the very loose nature of the peaty surface soil. Where stiff clay subsoil underlies the peat within reach of the plough it is desirable to bring up a little at each ploughing. The application of quicklime while the soil is still bare is to be recommended, rather than agricultural lime or slaked lime, for although the quicklime has a caustic action which is extremely harmful in burning out the organic matter on ordinary soils, this loss can be easily sustained on peat soils which are so rich in this constituent. The quicklime has an advantage over agricultural lime in this case, because of its quicker action in sweetening the mass of sour organic matter, and in weathering down any sour subsoil which is turned up by the plough. From 5 to 10 cwt. quicklime per acre will be sufficient.

Where this stiff clay subsoil exists near the surface, subsoiling may be expected to prove a profitable operation. This can be done roughly and cheaply by removing the mouldboard from the ordinary plough.

For still further assisting the drainage on the swamp land, ridge ploughing can be thoroughly recommended. This consists in ploughing (always in the same direction), in narrow "lands" or widths of 12 to 24 feet, leaving the "clean outs" or dead furrows to act as open drains.

### Crops and Fertilisers for Swamp Land.

Even in cases where it is recognised that the swamp land is still subject to overflow, it is possible that comparatively long periods may elapse between such occurrences, and the land is so well provided with nitrogen that it is too rich an asset to neglect, and in many cases the fear of overflow should not be allowed to deter the farmer from cultivation.

Summer fodders, such as maize, sorghum, Sudan grass, or Japanese millet will be found to be the most suitable, and the latter two crops may be regarded as the best to stand the wet conditions that must prevail at some time or other during growth.

Other minor crops that are worth trial as being most likely to be suited to this class of soil are celery, onions, rice, and mint. In these cases much depends on close proximity to market. Where the land is well drained potatoes and cabbages would probably do well.

Although rich in nitrogen, the soil is extremely ill-balanced and will usually respond readily to phosphates and potash. At least 2 cwt. superphosphate per acre should be applied with every crop sown, and tests should be made of the most profitable amounts of potash to apply. On some similar soils it has been found that the application of about 100 lb. of a high-grade potash fertiliser has increased the yields up to 400 per cent.

It is likely that the pastures on the swamp land will also show a profitable increase from the application of superphosphate (and perhaps of potash), in addition to lime.

### Crops and Fertilisers for Upland Soils.

Usually the upland soil is of sandstone formation, and cannot be relied on to produce good crops continually without careful treatment. No application of lime is necessary on this soil, and the most reliable crops are winter fodders—particularly wheat or rye. Neither of these are considered quite as good feed for dairy cows as barley or oats, but they will produce the better crops on the land in question. The summer fodders recommended for the swamp land should hardly be attempted here except, perhaps, a crop of sorghum occasionally. The rye should be utilised for grazing at intervals, and should never be allowed to grow to any height if it is intended to use it to the best advantage. The wheat or rye should be followed by cowpeas (sown in November or December), which can be utilised for grazing and still have some value for soil improvement. If this system is followed, with an occasional crop of sorghum, the fertility of these upland soils will be maintained with just the application of 1 cwt. superphosphate with each crop at sowing.

### Feeds for Dairy Cows.

Dairymen who are attempting to make a living on these soils before they have been properly sweetened and whose cows have developed bone-chewing habits, will find some additional feeds necessary to the maintenance of the stock and of milk production until the pastures have developed sufficiently, with time and treatment, to render them more sufficing.

Mr. J. A. Robertson, herdmaster to the Department, makes the following recommendations in such cases:—"If the cows are good average dairy cows it will pay to buy feed for them at the present prices. Lucerne chaff, bran or pollard, and linseed meal or coconut meal are the best concentrated feeds to purchase according to price. The best results would probably be obtained by drying off, in the autumn, all cows at all forward in calf and turning them out where grazing is reasonably good, supplying them, in addition, with bone and bran mixture. All newly calved cows could then be profitably hand-fed, and it would also be an advantage to rug them during the winter. Salt is also required and will greatly assist in keeping the cows in health and in preventing the bone-chewing."

### Conclusion.

With the long wait required on this class of land before it properly sweetens up, and the somewhat expensive treatment required—lime and fertilisers being essential—these reclaimed swamp lands cannot be regarded as equal to alluvial, although some owners are asking somewhat equivalent prices. With sufficient areas, however, these lands seem worth consideration as a proposition for dairying (with pig-raising as a side line on a small scale), provided they can be obtained at a reasonable price.

## The Poisonous Properties of Castor-oil Beans.

There recently appeared in the daily Press notices of a severe mortality amongst horses, due to the ingestion of castor-oil beans with imported chaff. Through the courtesy of the owner and the veterinarian in charge, an opportunity was given to a veterinary officer of the Stock Branch to examine the feed. It was found that some sacks of chaff contained, amongst other refuse, large numbers of different varieties of castor-oil beans. In order to put farmers and horse-owners on their guard it may be useful to point out that these beans are roughly oval, one-third to three-quarters of an inch long, and about half as broad, flattened on one side and marked with peculiar mottlings of red, brown, or black and grey. The poisonous effect of the beans, in addition to their purgative action, is due to the presence of a toxin ricin, which is found not only in the whole beans but in the residue after the oil is extracted; consequently neither the beans nor the residue are safe to feed, though the latter may be treated so as to destroy the toxin. Chaff containing these beans should on no account be fed. If by chance horses get them and show poisonous symptoms a veterinarian should be called in at once, as the cases are usually very serious.—S. T. D. Symons, Chief Inspector of Stock.

## The Rugging of Dairy Cattle.

The practice of rugging dairy cattle during the winter time has long been followed by a few farmers on the South Coast, but latterly there has been a considerable extension in the number of those who do it, more particularly on the tablelands where, without it, the milking season is limited to six or seven months of the year. Those who do it consistently are unanimous in testifying that it improves the general condition of the animals and maintains the milk flow in a very important degree. In a season like the present, when the winter has come in early and prices for feed are so high that it is imperative to adopt every expedient that will make the maximum use of every ton of fodder, the question of the use of rugs is one that is worth consideration.

One wasteful practice in particular arrests attention in this connection—that of putting a rug on a cow at the beginning of winter and allowing it to remain there for several months. The cow derives no advantage from rugging under such conditions. She swelters under it during the warm hours of the day, and her natural resistence to cold is reduced, so that she is more liable to its effects at night. Under the cover her coat becomes finer and her skin unhealthy and itchy, and sometimes even harbours lice. She is actually penalised by her rug during the day, and she derives little or no advantage from it at night. The life of the rug, too, suffers by this treatment, for it is continually in use, and the irritated animal, rubbing herself in it, soon wears it out.

On the other hand, if the cover is removed during the day, the coat thickens up under the cooler temperatures of the winter weather, and the cow feels the full advantage of it when it is put on in the evening. The skin, too, is kept clean, for the cow is able to scratch and lick herself during the day, and the rug, being hung up for a few hours, dries off and sweetens, and any necessary repairs can be effected before the damage becomes too extensive.

Rugging is a practice of solid value, but, like many other things, it requires to be done properly to yield its full profit.—J. A. Robertson, Herdmaster.

## Ants in a Bee-hive.

Although the little black ants rarely disturb a colony of bees to any extent, it would be as well to have them removed if they are inside the hive. The ants should be brushed out, the hive set up on pegs, and a tarred rag wound round each peg to prevent their re-entry. For the destruction of these ants in their nests when on the ground, mix 1 oz. of borax and ½ lb. sugar boiled for three minutes in sufficient water to produce the consistency of thin honey. This mixture can be placed anywhere in the track of the ants and they will generally disappear, as it acts as a poison to the young. The bees will not take the mixture, owing to it being repellent to their taste.—W. A. Goodacre, Senior Apiary Inspector.

A North Coast correspondent writes: "I wish to thank the Department for their valuable *Gazette*. I have derived great benefit in a hundred different ways by reading and practising what the *Gazette* teaches, and I look forward to it every month."

# Chats about the Prickly Pear.

## No. 4.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist and Director, Botanic Gardens, Sydney.

### Prickly Pear as Stock Food—(*continued*).

A FEW extracts from reports by stock-owners as to the value or otherwise of pear for feed may be of interest at this stage. They were mostly addressed to myself, and were written during, or within the recollection of, droughty times. They are the opinions of experienced men, but while they were valid at the time they were written, it does not follow that they would express the opinion of the writers to-day. Some of the reports in regard to pest pear are unfavourable and some are favourable.

Perhaps I might explain that at one time I could see but very little or no good in pear; now, I find more good. I do not say it is a first-class fodder by any means, but I do say that it possesses certain properties in this direction which should encourage us to combine pear-feeding and pear-clearing in the same operation. We have a good deal to learn yet as to the best appliances to use in handling pear—chopping it, burning, &c.—and how to wisely feed it to stock. We do not even know the breeds of cattle which will flourish best on pear, though in Southern Italy they have found a Holstein cross do well on it.

1. *Scone, N.S.W.*—During the 1902 drought we were feeding between 1,000 and 1,200 cattle, out of which we lost 500 or 600 head. We do not think much of it as a food for cattle, and if we had not discontinued using it we would have lost the lot. Re treating of the pears—first, we cut all the tender leaves only and carted same to a large dam where we had four 400-gallon ship tanks cut in halves, which we used as boilers. We put the leaves of the pears into these tanks, together with a little rock salt, and boiled same for four hours. After that time we took out and let cool; when cool we carted and spread out in paddock for cattle to eat. They soon got tired of these and we then tried them mixed with molasses, but it did not have the desired effect. The majority of cattle that died, when opened, contained a big ball of the pear fibres.—BAKEWELL BROS.

2. *Municipality of Muswellbrook.*—In reply to your inquiry re the value of the prickly pear as a cattle food, I have to state that a prominent local dairyman, Mr. Jas. Wilkins, writes that he has been using prickly pear as fodder at different times during the past fifteen years, and prepared it in three ways, viz., by roasting, boiling and steaming, and is convinced that if dairy stock be fed on pears so treated before they get into low condition, they will not only live but milk fairly well. The best results are obtained by "chaffing," or cutting the pears into very small pieces. Stock will not fatten on this food, but after being sustained on it they will quickly improve in condition when supplied with more nutritious fodder.

The Mayor (Mr. Alex. Weidmann), who has also had experience with the pears as cattle food, states that good results are obtained by mixing the pears with hay, lucerne, chaff or pollard. The greatest objection to the pears when not cut small is the fact that cattle thus fed experience much difficulty in chewing the cud, on account of the fibrous nature of the plants. This drawback may, however, be obviated by chaffing the pears.

The Council did not clear the common of pears by the residents using them for fodder some three years ago, as the demand was not equal to the supply, but for some weeks

past have had a man engaged in cutting and roasting pears for the horned cattle on the common, there being little or no grass thereon, owing to the dry weather; and the said cattle by being thus fed have kept in fair condition.

Experience accordingly shows that prickly pears make a useful but inferior fodder, even when prepared as described, but can be used with advantage in time of drought as a substitute for better food, cattle, like mankind, being able to, to some extent, adapt themselves to circumstances in the matter of sustenance.—PIERCE HEALY, Council Clerk, 8th January, 1906.

3. I find that this plant was much used as fodder during the drought of 1902, and is now being used by many, owing to prevailing dry weather and absence of natural grasses and herbage. On inquiring from those who are using it, I find that it is a last resource; in itself it has little or no value as a fodder plant. Cattle will eat when compelled to by hunger, but, being of a greasy nature, it cannot be properly masticated by horned cattle. A local dairyman, by boiling, then chopping and mixing with lucerne or oaten chaff, is using a considerable quantity daily, approximately 12 cwt., and with this mixture is feeding a small dairy herd for the supply of fresh milk locally.

I interviewed three graziers, Mr. J. C. White, of Edenglassie, Mr. C. E. Doyle, of Dartmouth, and Mr. Parbury, of Satur. These men used the pear rather extensively during the disastrous drought of 1902, and are unanimous that as a fodder plant it has a very low value, and is used as a last resource. It helps to keep stock alive, but if they are weak their digestive organs will not allow of this food being used with good results.—O. G. NORTON, District Assistant Engineer, Muswellbrook, 19th January, 1906.

The attitude of the Hunter River stockowners, who "have had more experience of prickly pear than the graziers of any other part of Australia," is recounted in an article by the late Mr. R. T. Keys, of Muswellbrook, in the Sydney *Stock and Station Journal* (reference mislaid) and reproduced in the *Queensland Agricultural Journal* for August, 1908, page 61. It is condemnatory of the use of the pear as fodder.

The following two reports are, however, more favourable:—

1. In the *Agricultural Gazette* for June, 1897, Mr. J. O'Shea, of Singleton, protested against the Government ordering the destruction of the prickly pear, and stated how valuable a supply would be during the then droughty time.

2. I fed eighty-five cows for three months this summer on prickly pear and a very little bran and they did well on it.

I was peremptorily ordered by Government to destroy my prickly pear. I boiled it all down for my cows and it was my most valuable fodder. I had three 400-gallon tanks for boiling it, and besides my cows had seventy pigs which had nothing else for that time, and they did famously on it. My bulls kept in show order—with a little bran mixed.

The two pests, prickly pear and *Aristida ramosa* [a coarse grass, J.H.M.], carried my stock through the worst of the drought, and I don't know what I should have done without them. I must say a good word for them.—SYLVESTER BROWNE, Minembah, Whittingham, 1st January, 1908.

Mr. Browne was the introducer of Rhodes grass and other grasses to Australia, and one of the most distinguished of our experimenters with fodder plants.

Further accounts of prickly pear as a fodder are available from two farmers in the Campbelltown-Camden district.

1. In 1895, Mr. J. F. Gorus, of Eschol Park, Minto, near Campbelltown, used the prickly pear on the property, boiled with meat and refuse, for pigs, combining this with pear-clearing operations. (See this *Gazette* for October, 1896, page 658.) Pear was used as an auxiliary food for nearly 200 pigs for several months. Mr. Gorus speaks favourably of his experiments—he fed his pigs and exterminated the pear.

2. In February, 1908, I visited, by invitation, the dairy farm of a well known gentleman in the Camden district (the late Mr. F. W. Downes, M.L.A.) who had been utilising the local pest pear for twelve months previously. So far as I know, the food value of this pear is much the same as that of the Indian fig pear (*Opuntia ficus-indica*).

To convey the pear he used slides 5 feet 6 inches long and 4 feet 6 inches wide. One slide filled half a 400-gallon tank, these vessels being cut into two for the purpose of preparing the pear. These half tanks stand on bricks, with a fire underneath, and the pear becomes more or less cooked, a little water being used. Three bran bags loosely packed with lucerne hay, and also 8 bushels of bran are provided for each two half tanks. At feeding time the cows were yarded, and a heaped-up kerosene tin of the above pear was put into each cow's trough. The cows were then admitted into the stable. There was no confusion. Each cow deliberately walked to her own particular trough, ate every particle of pear, &c., and then licked her lips for more.

There is no doubt that this pear mixture is palatable to the cows; to what extent the pear alone is nutritious it is impossible to say, from the above experiments. I asked the enterprising owner some time afterwards: "The pear is a food; do you like it on your property, or would you rather be without it?" He replied at once, "I would rather be without it."

One other testimony may be quoted, that of a farmer nearly 300 miles west of Sydney:—

I have cultivated *Opuntia ficus-indica* for pears as feed for stock, and find that cattle keep it eaten down till it dies if allowed unrestricted access to it, and I consider it a useful fodder plant.—JOHN ALLISON, "Fresno," Dubbo, 11th March, 1914.

### A Texan Method.

The following account of the experience of Mr. J. C. Glass, a Texan stock-owner, as recorded in U.S. Bulletin No. 74, p. 39, may be usefully compared with the experience of one or two of the farmers and pastoralists quoted above. Except in certain districts, we in Australia probably do not know how to feed prickly pear to stock:—

1. The feeding was begun after cattle had begun to die.

2. Feeding was practised to keep cattle alive, not to fatten them.

3. The pastures were worked continually, and a watch was kept for weak cattle.

4. The stronger cattle in the feed pens were constantly being replaced by weaker ones from the pastures.

5. From 1 lb. to 1½ lb. of cotton-seed meal was fed to each animal, in addition to all the chopped pear it would eat.

6. All except the very weak cattle were allowed the run of the pastures.

It will be seen from these statements that the stock obtained some feed in addition to the pear and meal, even from the brush pastures where they were dying before the feeding began. No attempt was made to do anything but keep the animals alive until the drought was broken. An effort was made, however, to give the cattle all the pear they would eat. As nearly as can be estimated, therefore, 80 acres of excellent pear furnished a full ration for an average of 800 head of cattle for a period of six months.

## Queensland Experience.*

In the *Sydney Mail* of 9th August, 1902, is a picture of cattle from Womblebank Station (Queensland) fattened on prickly pear. It is stated that "these bullocks settled down on the prickly pear country about two years ago, when the drought was beginning to be felt very severely, and have existed entirely on the pear in its raw state ever since, and with hundreds of others have done remarkably well upon the fodder." The Womblebank cattle are a credit to their owner, but I must be excused if I decline to believe that they got their fine bony framework (not to speak of their muscular tissue) from prickly pear. No analysis that I have ever seen shows phosphates in these plants sufficient for the building up of a fat bullock. Water, of course, they can do without, for prickly pear contains about 90 per cent. of that useful beverage. The late Mr. Dowling, the editor of the *Mail*, brought Mr. W. J. King, the manager of Womblebank, to my office for a chat. Mr. King had brought these bullocks from Roma to Sydney. He informed me that the bullocks got pickings of grass, saltbush and scrub, both on Womblebank and on the way down to Sydney.

There arose a furious controversy, some of which will be found in the Sydney *Stock and Station Journal* at the time, about these Womblebank bullocks and prickly pear.

Mr. R. S. Archer, the Manager of Gracemere, near Rockhampton, celebrated for its dairy farm, wrote under date 25th November, 1902:—

> The dairyman [*i.e.*, certain dairymen who had spoken disparagingly of prickly pear.—J.H.M.] must have struck a bad sort of pear or cannot have treated it properly, as we must have used 1,500 tons at least this season, and by its use kept 500 milkers alive and our business together, as, without it, we couldn't have faced buying chaff at £10 a ton. The pear has on an average cost us 7s. 6d. per ton to cut, prepare and feed—say 1,500 tons, £562 10s. Fifteen hundred tons of pear equals 500 tons of chaff at £10—£5,000; say, a saving of £4,437 10s.

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* Since the above was written I have seen for the first time (10th May, 1920) a valuable bulletin for stock owners, dated 1st May, 1918, and issued by the Prickly Pear Board of the Queensland Department of Agriculture and Stock. The Board consisted of Messrs. Cory, Brunnich, Graham and Quodling. Had I seen this bulletin before I would have referred to it in its place. It is based on experiments made by Mr. Frank Smith, B.Sc., formerly Assistant Chemist to the Department, and the bulletin itself is described as a practical one, as setting out clearly and concisely, and in a non-technical manner, the results of trials conducted at Wallumbilla, Maranoa district, Queensland, of prickly pear as stock feed, and as touching the existent value of the plant and its possible utility for feeding purposes. *Inter alia*, the writer says:—

"In revising the question of applying data secured in stall-feeding to the case of beasts running at large in pear country, it may be pointed out that where the elemental conditions are the same the results will be parallel and variant only in degree, also the possible superior benefit to animals through individual selection of feed was the subject of trial, and is estimated. The directions given for the preparation of prickly pear for farm stock are recommended, as the rations embodying it—prescribed for various purposes—were based upon experiments conducted with an adequate number of animals and over considerable periods.

"More especially would attention be drawn to the value of the plant as a standby for stock in drought. Its use, in conjunction with other foods, intelligently fed to stock, with appreciation of deficiencies of pear as a fodder, should assist in diminishing the disastrous losses hitherto sustained by stock-owners."

There is a valuable summary at page 21, and there are illustrations of the effect of pear-feeding on both cattle and sheep. I believe it to be the most valuable publication of its kind that has appeared in Australia so far.—J.H.M.

Our ration is 35 lb. to 40 lb. chaffed and steamed pear, and 3 lb. bran, per cow, and on that they keep in good condition and average 6 lb. milk a day, a little over 2 quarts, which we now retail at 6d. per quart. Unfortunately, we cannot sell all we have. The other milkmen are mostly feeding as we are. At one dairy we are boiling the pear and slashing it up with knives in the troughs, and they eat it all right that way. Unfortunately there is no pear at the 15-mile, so that we can only cut oaks and vines along the creeks, on which the stock do not do well. They held out well till this month, but the last three weeks we have lost a good many breeding cows. We have now cut all the pear this side of the river, and are getting it from North Rockhampton at 4s. per ton delivered on trucks. [This was mostly pest pear !—J.H.M.]

Mr. G. L. Archer, then Pastoral Inspector of the Commercial Banking Company of Sydney, informed me, on 6th December, 1906, that Mr. Walter Horwood, of Daandine, Macalister, Queensland, fed prickly pear throughout the drought from April to December, 1902, to 1,400 cattle. For four months they had prickly pear entirely, and thenceforward 1 lb. bran per day per beast. He described it as spinescent *inermis* (pest pear), which gets more spinescent in shelter of brigalow scrub. [Note this.—J.H.M.]

An article, "Prickly Pear and the Spineless Cactus for Stock Food," by Joseph Burtt-Davy, *Transvaal Agricultural Journal*, October, 1909, page 19, is worthy of reference, because Mr. Davy, a competent botanist and agriculturist, has had great experience both in California and South Africa, and he compares American and South African conditions and experience with pear. He quotes U.S. Bulletin 74 freely.

### Prickly Pear as Fodder in India.

The utilisation of pear as fodder in India is discussed at length at page 21 of the report of the Queensland Travelling Commission, but the labour and other conditions of India very widely differ from those on our pear areas. The very latest official pronouncement on the subject is worthy of reference.

There is an article entitled "Cactus as a Fodder Substitute" which will be found in the *Tropical Agriculturist* for February of the present year, page 91, taken from the *Agricultural Journal*, vol. xiv, part v.

The locality referred to is the Ahmednagar district in the Bombay Presidency in India, and the reference is made by the Hon. Mr. L. J. Mountford, Commissioner of the Central Division. He relates that he has been touring through certain areas and inspecting cattle camps and villages where cattle are fed on cactus, that being the name that prickly pear goes under in India. He is of opinion that the villagers have a very valuable fodder adjunct for their kadbi (sorghum stalks) in cactus properly prepared. The local method consists in roasting the cactus over a village forge and chopping it fine. Sometimes, as a substitute for kadbi, they add 2 lb. of cotton seed and occasionally 1 lb. of chuni (gram and lentil husks) to the 24 lb. full seed. He states that in the camps and kitchens he visited he found cattle eating the stuff greedily. Some cattle and buffalo will eat the prepared leaves whole, but chopped fodder is best. The people are quite enthusiastic, and from reports received some villages have taken to this fodder almost in a body.

Cactus operations are not new to Ahmednagar, as they were carried out in 1912; but the village busy-body was not absent. Various rumours were started which at first somewhat impeded the campaign, such as that compulsory payment would be insisted

on when the cactus campaign was closed; that the animals would die, and when it was found that animals did not die, that they would die off in the rains. This prophecy still obtains among cactus opponents.

Villagers visit the camps and kitchens with their cattle, or ask to be allowed to take some rations away to their villages; where possible, choppers, bellows and prongs are given them. Many come to Mr. Beytz's bungalow for instruction, and while I was there two very fine cattle in splendid condition were brought by their owner to be taught to eat cactus. I have seen cattle brought in by their owners eat their ration for the first time straight away.

Cattle which had not the strength to raise themselves from the ground two months ago in some of the camps are now able to do light work at the *mhote* and to pull the cactus carts. Mr. Beytz purchased many miserable animals in the last stage of exhaustion from the butchers for a few rupees, and after feeding them on cactus preparation has sold them to the ryots for three times the purchase money. Mortality was very heavy before the cactus campaign started. One owner told me he lost seven of his cattle that he had fed on grass purchased for Rs. 2,000, and that he had lost none since he took to cactus. The mortality in the cactus camps has been slight.

At present there are over 34,000 cattle feeding on cactus, and it would have been utterly impossible to find grass or kadbi to feed these cattle. They would require at least eight pounds of grass or kadbi a day (a low all-over daily average for cattle and young stock); some 272,000 pounds, or over 80 lakhs per month. This amount of grass could not be obtained.

At the Commissioner's request a report from Lieutenant-Colonel G. K. Walker, the Superintendent of the Civil Veterinary Department of the Bombay Presidency, was made and is attached to Mr. Mountford's report. This is what he says:—

I have visited cattle camps in the Ahmednagar and Poona districts where cattle are being fed on prickly pear, and recently I made a detailed inspection in the Ahmednagar district in this connection. I paid surprise visits to a number of villages in various directions where the fodder was being used, and visited certain camps. I also visited the charitable camp at Ahmednagar where the cattle were being fed on dried grass and kadbi, no prickly pear being used.

I can bear out the Hon. Mr. Mountford's statements in every particular. There can be no doubt that cattle can be maintained on prickly pear when necessary without harm. It is not claimed that it ranks as a good fodder, and it should be supplemented with a certain amount of dried grass if possible, in addition to some proportion of concentrate. Cattle require a proportion of green fodder to keep in good health, and the dry grass that passes as hay in this country is frequently so inferior and innutritious that it causes internal disorders, especially in debilitated cattle. Animals have their idiosyncrasies, and there may be cases where prickly pear causes indigestion, especially if it is improperly prepared. It is essential that all the prickles should be removed. Like all green fodders it produces some looseness in the bowels, which is considered normal to cattle in countries where green fodder is common. Any excessive looseness can be remedied usually by supplying fodder in intelligent proportions. Diarrhœa in cattle in the rains is common from various causes.

I beg to say that in my opinion the cactus fodder campaign, particularly in the Ahmednagar district, has been a great success, and that by the aid of this fodder a very large number of cattle that would otherwise have died have been saved. The work in the Poona district has also been effectual. A very pleasing feature in this Ahmednagar district is the obvious satisfaction of the cattle-owners when once they have been persuaded to take up the method. They have learned to appreciate its advantages, and in many places their own arrangements are well devised and working well.

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"A SOIL in good tilth is almost invariably a productive one, provided seasonal conditions are favourable."—FRANK T. SHUTT, D.Sc., Dominion Chemist, Canadian Department of Agriculture.

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"THE *Gazette* is a great help. It is often of real service to the man on the land."—An Ingleburn correspondent.

# The Testing of Pure-bred Cows in New South Wales.*

L. T. MACINNES, Dairy Expert.

THE year commenced with 373 privately-owned cows, representing forty-three herds, under test. Government-owned stock numbered eighty, making a total under test of 453. There was then every indication that next report would show that both the stud herds and the number of cows entered had been very considerably increased; but these anticipations were not realised to the full extent anticipated, although the expansion has been appreciable, and under the circumstances satisfactory. The unexpected severity and duration of both the influenza epidemic and the drought proved a great hindrance to this movement. It was only at the beginning of 1920 that rain came to relieve the coastal districts north of Sydney, the tablelands, and the central-western areas. The effect of these adverse conditions is shown by the number of privately-owned cows withdrawn from testing before the completion of their official period. These numbered no less than 268, more than double those completing tests during the previous year.

The full records show that in spite of the bad season and the high price of fodder (which in some instances was almost unprocurable), the average yields compare not unfavourably with the standards of last year—undoubtedly under better conditions previous averages would have been reached or exceeded.

The value of hereditary production has again and again been stressed at these annual meetings, and is coming to be recognised as the keystone to the breeding of good utility dairy stock. It is therefore pleasing to be able to record that recent purchases of imported pure-bred stud stock have been made to a great extent on these lines. This course should materially help in advancing the productiveness of our herds.

A noteworthy feature in this connection is that according to recent English news files to hand, English and Scottish breeders are now taking steps to ascertain the fat production of their stud cows, in addition to keeping their records of milk weights. This is evidently in response to the general demand from all parts of the world for full production records, and it indicates that a record giving the weight of milk alone does not meet the requirements of buyers. It is a hint that many stud breeders of dairy stock in this State might give attention to with advantage to their future sales. The testing movement is slowly and surely coming to the front, and the future is for the breeder who indisputably demonstrates that the strains he handles have high hereditary production to support type and general appearance.

* Extracted from the official report for presentation to the annual meeting of the United Pure Bred Dairy Cattle Breeders' Association of New South Wales, covering the year ended 28th February, 1920.

**Progress made during the Year.**

The actual progress made during the past year in the testing of the stud dairy stock of this State is shown in the following tables:—

PRIVATELY-OWNED Cows completing tests of 273 days.

| Breed | Prior to 30 June, 1917. | Year ended 28 February. | | | Increase at 1920 over 1919. | |
|---|---|---|---|---|---|---|
| | | 1918. | 1919. | 1920. | Number. | Percentage. |
| Milking Shorthorn ... | 147 | 44 | 48 | 120 | 72 | 150 |
| Illawarra ... ... | ... | ... | 6 | 103 | 97 | Sixteen-fold. |
| Jersey .. ... | 579 | 19 | 28 | 59 | 31 | 110 |
| Guernsey .. ... | 37 | 7 | 9 | 18 | 9 | 100 |
| Ayrshire ... ... | 34 | 14 | 20 | 44 | 24 | 120 |
| Friesian ... .. | ... | ... | 13 | 21 | 8 | 61 |
| Total .. ... | 797 | 84 | 124 | 365 | 241 | 194 |

The total number of privately-owned cows tested to 1st March, 1920, was 1,370. That the number of all privately-owned cows completing a 273 days' test has been trebled under such adverse circumstances as obtained during the year is a matter for congratulation. The Illawarra breeders are especially worthy of commendation for the manner in which they are now submitting their herds to testing.

The number of Government cows completing the official period was sixty-four. This makes a total of 429 for the year, as against a total of 170 for the previous twelve months.

SUMMARY of all Cows tested for 273 days or submitted for test during the year.

| Breed. | Test Completed. | | | No. on Test at 1 March, 1920. | | | Total No. withdrawn during the year. |
|---|---|---|---|---|---|---|---|
| | Private. | Government | Total. | Private. | Government. | Total. | |
| Milking Shorthorn.. | 120 | 11 | 131 | 142 | 20 | 162 | 103 |
| Illawarra ... ... | 103 | ... | 103 | 131 | ... | 131 | 60 |
| Jersey ... ... | 59 | 27 | 86 | 39 | 27 | 66 | 78 |
| Guernsey ... ... | 18 | 14 | 32 | 33 | 24 | 57 | 5 |
| Ayshire ... ... | 44 | 8 | 52 | 41 | 2 | 43 | 16 |
| Friesian ... ... | 21 | ... | 21 | 13 | ... | 13 | 10 |
| Red Poll ... .. | ... | 4 | 4 | ... | 1 | 1 | 1 |
| Total ... ... | 365 | 64 | 429 | 399 | 74 | 473 | 273 |

The total number of cows undergoing test on 1st March, 1920, was twenty more than the previous year's figures.

The number of cows submitted for test in the twelve months but for various reasons (principally sickness, influenza epidemic and drought) withdrawn before completing the official testing period, was more than double the total number of privately-owned stock tested last year.

The total number of records of cows officially tested for the full period since the inception of the scheme in 1913 is as follows :—

| | | |
|---|---|---|
| Number of completed tests to 1917 | ... ... | 1,314 |
| " " " in 1917–18 | ... ... | 233 |
| " " " " 1918–19 | ... ... | 170 |
| " " " " 1919–20 | ... ... | 429 |
| Total completed tests to 1st March, 1920 | ... | 2,145 |

NUMBER of Privately-owned Herds undergoing Test.

| Breed. | 1918. | 1919. | 1920. |
|---|---|---|---|
| Milking Shorthorn ... | 4 | 13 | 18 |
| Illawarra .. ... | 2 | 10 | 19 |
| Jersey ... ... ... | 4 | 10 | 14 |
| Guernsey ... ... | 1 | 5 | 7 |
| Ayrshire ... ... | 1 | 3 | 7 |
| Friesian ... ... ... | 1 | 2 | 3 |
| Total ... ... | 13 | 43 | 68 |

This marked increase in the number of herds tested, especially as it is spread over all breeds and distributed throughout the principal dairying districts, is even more satisfactory than the increase already commented on in the total number of cattle tested, because it shows that the influence of the Association's testing scheme is widening, and becoming a greater factor in spreading the benefits of the testing movement. Each additional breeder who takes up testing creates in his district an atmosphere appreciative of the value of records and of hereditary production. Thus the value of the pure-bred sire of production strain becomes better known, and a greater demand is created for him over a wider area.

### Average Tests of all Standard Cows Recorded.

The average butter-fat percentages for this and the last two years are set out in the following table according to the different standard ages adopted by the Association :—

| Age Standard. | Fat per cent. | | |
|---|---|---|---|
| | 1917–18. | 1918–19. | 1919–20. |
| 4 years and over ... | 4·5 | 4·18 | 4·11 |
| 3 " under 4 ... | 4·3 | 4·37 | 4·06 |
| Under 3 years ... .. | 4·45 | 4·48 | 4·31 |

The averages for all cows tested since 1915 are as follows :—

| | | | |
|---|---|---|---|
| 1916–17 ... | 4·4 | 1918–19 ... | 4·3 |
| 1917–18 ... | 4·5 | 1919–20 ... | 4·14 |

These tests are given for the information of buyers of pure-bred stock, especially in distant countries, in order that they may have an indication of the average fat-content of the milk of the stock being tested in New South Wales. They also serve to show that the fat-content as worked out on the averages of a number of animals does not vary to any great extent at the different ages cited.

AVERAGE Yields of Privately-owned Cows, 4 years old and over.

Official Standard, 249 lb. butter-fat in 273 days.

| Breed. | Average Yields. | | | Above Standard. | | Yield. | |
|---|---|---|---|---|---|---|---|
| | Milk. | Butter-fat. | Average Test. | No. of Cows. | Average Fat. | Lowest Butter-fat. | Highest Butter-fat. |
| | lb. | lb. | per cent. | | lb. | lb. | lb. |
| Milking Shorthorn | 7,158·5 | 276·4 | 3·86 | 40 | 27·4 | 152·2 | 490·8 |
| Illawarra ... ... | 6,899·8 | 276·4 | 4·00 | 46 | 27·4 | 132·9 | 490·6 |
| Jersey ... .. | 5,348·3 | 260·4 | 4·87 | 21 | 11·4 | 141·7 | 440·7 |
| Guernsey ... ... | 6,546·2 | 296·9 | 4·53 | 7 | 47·9 | 182·4 | 469·7 |
| Ayrshire ... ... | 6,817·3 | 274·7 | 4·03 | 15 | 25·7 | 202·0 | 433·4 |
| Friesian ... ... | 9,329·4 | 307·1 | 3·29 | 9 | 58·1 | 216·5 | 410·0 |
| All Breeds ... | 7,014·9 | 282·0 | 4·02 | 138 | 33· | 132·9 | 490·8 |

In this class 75 failed to reach the standard; in other words, 66 per cent. reached or exceeded the minimum of 249 lb. fat set for mature cows, as against 84 per cent. last year. Compared with that year, too, it will be seen that the average yield for all breeds is some 41 lb. less in butter-fat and 714 lb. less in milk.

The Government-owned Jersey cow, Wagga Jasmine, gave this year 9,534 lb. milk, 600 lb. butter-fat, with an average test of 6·3 per cent. This record is very much ahead of any other of her breed, and exceeds that of all other breeds for this year for fat.

AVERAGE Yields of Privately-owned Cows, 3 years and under 4.

Official Standard, 207 lb. fat in 273 days.

| Breed. | Average Yields. | | | Above Standard. | | Yields in Fat. | |
|---|---|---|---|---|---|---|---|
| | Milk. | Butter-fat. | Average Test. | No. of Cows. | Average Fat. | Lowest. | Highest. |
| | lb. | lb. | per cent. | | lb. | lb. | lb. |
| Milking Shorthorn ... | 6,818·4 | 276·7 | 4·05 | 14 | 69·7 | 178·9 | 587·1 |
| Illawarra ... ... | 6,841·8 | 269·8 | 3·94 | 14 | 62·8 | 142·7 | 415·9 |
| Jersey ... ... ... | 4,672·2 | 229·4 | 4·90 | 8 | 22·4 | 147·4 | 352·8 |
| Guernsey ... ... | 6,027·8 | 272·4 | 4·52 | 4 | 65·4 | 243·3 | 294·6 |
| Ayrshire ... ... | 6,040·3 | 242·0 | 4·00 | 8 | 35·0 | 114·7 | 288·3 |
| Friesian ... ... | 8,475·6 | 275·2 | 3·25 | 5 | 48·2 | 250·4 | 301·6 |
| All Breeds ... | 6,479·3 | 260·9 | 4·03 | 53 | 53·9 | 114·7 | 587·1 |

Here, 13 failed to reach the standard out of 66 tested, the percentage attaining or exceeding the minimum of 207 lb. fat being 80·3. Compared with last year's figures the average yield of all breeds is practically the same in butter-fat, viz., 260·9 lb. as against 260·26 lb., while the average milk yield for the last twelve months was 561·9 lb. greater.

Taking the individual breeds of this class, the present records demonstrate that in milk and butter-fat the Milking Shorthorns, Guernseys, and Friesians made a big average advancement; on the other hand, Illawarras, Jerseys, and Ayrshires averaged less in both milk and fat than they did for the year 1918–19.

AVERAGE Yields of Privately-owned Cows, under 3 years.
Official Standard, 166-lb. fat in 273 days.

| Breed. | Average Yields. | | | Above Standard. | | Yields in Fat. | |
|---|---|---|---|---|---|---|---|
| | Milk. | Butter-fat. | Average Test. | No. of Cows. | Average Fat. | Lowest. | Highest. |
| | lb. | lb. | per cent. | lb. | lb. | lb. | lb. |
| Milking Shorthorn ... | 6,015·8 | 268·3 | 4·46 | 26 | 102·3 | 181·1 | 325·1 |
| Illawarra ... ... | 5,628·8 | 220·3 | 3·91 | 16 | 54·3 | 160·8 | 353·7 |
| Jersey ... ... ... | 4,521·5 | 225·7 | 4·99 | 5 | 59·7 | 153·2 | 303·0 |
| Guernsey ... ... | 4,976·3 | 244·0 | 4·90 | 2 | 78·0 | 218·0 | 270·0 |
| Ayrshire ... ... | 5,563·0 | 228·4 | 4·10 | 14 | 62·4 | 181·3 | 313·1 |
| Friesian ... ... | 9,155·0 | 320·9 | 3·51 | 6 | 154·9 | 222·8 | 431·9 |
| All Breeds ... | 5,976·7 | 251·3 | 4·20 | 69 | 85·3 | 153·2 | 431·9 |

Out of 72 tested only 3 did not reach the standard, viz., 2 Jerseys and 1 Illawarra. The average yield of all breeds is seen to be 218 lb. milk and 24·7 lb. fat below last year's record. Of the various breeds tested, the Milking Shorthorns alone show an increase over the 1918–19 average fat for that breed, although their average milk yield has declined. The quantity of milk given by the Ayrshires is about the same. The highest productions in each breed are, with the exception of Ayrshires, below last year's figures. The Ayrshire section shows a considerable increase. No Friesian heifers were tested during the previous term, but the records in milk and fat of the leading four of this breed put up this year are well ahead of all others in the class, and a fifth Friesian heifer is ahead of the leaders of the other breeds in milk, while about equal to their best in fat production.

Of the Government stock tested in this class, the best were Princess May II, a Guernsey with 4,978 lb. milk, 287 lb. fat, 5·7 per cent. test; and Eleanor, a Jersey, with 5,175 lb. milk, 275 lb. fat, 5·3 per cent. test.

### Privately-owned Cows Completing 365 Days' Test.

Last year 14 cows completed a 365-days' record, made up of 13 Milking Shorthorns and 1 Illawarra, a heifer. Of the former breed, 3 were in the junior class, 2 in the intermediate, and 8 were seniors. This year 15 representatives of four breeds completed the longer period, viz., 10 Milking

Shorthorns, 2 Illawarras, 2 Guernseys, and 1 Friesian. Of these, far and away the best yield was that of the Guernsey Tulip des Pres with 15,759 lb. milk, 728 lb. fat, 4·7 per cent. average test, followed by her stud mate Betsy III of the Vanquedor, with 12,091 lb. of milk, 564 lb. fat, 4·6 per cent. average test. The Illawarra cow, Duchess of Nestlebrae, is credited with 10,525 lb. milk, 440 lb. fat, average test 4·1 per cent., while the best of the Shorthorns was Minnie XI, with 9,489 lb. milk, 397 lb. fat, 4·2 per cent. average test. All the foregoing were in the class 4 years and over.

Of those 3 years and under 4, only Milking Shorthorns were represented, of which Champion XII was the best, with 8,913 lb. milk, 352 lb. fat, 3·9 per cent. test.

Amongst the 6 heifers which also completed a 365 days' test, the best was the very fine performance of the Friesian, Woodcrest Netherland Queen, with 14,460 lb. milk, 542 lb. fat, 3·7 per cent. average test. The best of the others, which were all Milking Shorthorns, was Empress, with 10,292 lb. milk, 410 lb. fat, average test 3·9 per cent.

### Government Cows.

The number of Government stock reaching the official standard under the scheme this year was 54, as against 46 in the previous twelve months. The number entered was 59, but 5 were withdrawn before completing 273 days. The number under test at 1st March, 1920, was 74. The dry season, which has already been alluded to in its effect on privately-owned stock, similarly retarded the testing of those on the Government farms.

AVERAGE Yields of Government Stock.

| Breed. | Average Yields. | | | Above Standard. | | Yields in Fat. | |
|---|---|---|---|---|---|---|---|
| | Milk. | Butter-fat. | Average Test. | No. of Cows. | Average Fat. | Lowest. | Highest. |
| **4 Years and over: Official standard, 249 lb. butter-fat.** | | | | | | | |
| | lb. | lb. | per cent. | | lb. | lb. | lb. |
| Milking Shorthorn ... | 7,335·2 | 279·3 | 3·81 | 9 | 30·3 | 185·8 | 335·8 |
| Jersey ... ... ... | 5,908·0 | 330·8 | 5·60 | 14 | 81·8 | 220·3 | 599·8 |
| Guernsey ... ... | 6,440·6 | 348·7 | 5·41 | 4 | 99·7 | 301·2 | 461·9 |
| Ayrshire ... ... | 6,336·0 | 259·3 | 4·09 | 3 | 10·3 | 225·9 | 302·0 |
| Red Poll .. ... | 5,932·0 | 254·6 | 4·29 | 1 | 5·6 | 212·3 | 362·0 |
| All Breeds ... | 6,390·6 | 294·6 | 4·60 | 31 | 45·6 | 185·8 | 599·8 |
| **3 Years and under: Official standard, 207 lb. butter-fat.** | | | | | | | |
| Jersey ... ... ... | 4,963·6 | 263·6 | 5·11 | 4 | 46·6 | 221·1 | 279·2 |
| **Under 3 Years: Official standard, 166 lb. butter-fat.** | | | | | | | |
| Jersey ... ... | 4,592 | 238·1 | 5·18 | 6 | ...... | 196·8 | 275·5 |
| Guernsey ... ... | 4,573 | 231·4 | 5·06 | 10 | ...... | 197·1 | 287·3 |
| Ayrshire ... ... | 4,722 | 205·9 | 4·36 | 3 | ...... | 206·4 | 239·7 |
| All Breeds ... | 4,629 | 225·1 | 4·86 | 19 | ...... | 196·8 | 287·3 |

### Summary of Production Standards.

The following table shows the average yield of all Government and privately-owned cattle that have completed the 273-days' tests during the last two years, as compared with the official standards for the different ages:—

| Class. | 1919–20. | | | 1918–19. | |
|---|---|---|---|---|---|
| | Official Standard. lb. fat. | Average Yield. lb. fat. | In excess Standard. lb. fat. | Yield. lb. fat. | In excess Standard. lb. fat. |
| 4 years and over ... ... | 249 | 284 | 35 | 326 | 77 |
| 3 years and under 4 ... ... | 207 | 260½ | 53½ | 264 | 57 |
| Under 3 years ... .. | 166 | 246 | 80 | 252 | 86 |

It is once more made evident that the standard adopted by the Association is not on the high side; rather the reverse, as it has been considerably exceeded by the average in all three classes during the past three years. The above table shows the position for the last two years. The calculations in 1917–18 were made on the O'Callaghan chart in terms of estimated butter, and cannot be compared exactly with the foregoing, but they also show a considerable excess, as follows:—

4 years old and over—Standard, 300 lb. butter.
Actual average, 434 lb.

3 years old and under 4—Standard, 250 lb. butter.
Actual average, 354 lb.

Under 3 years old—Standard, 200 lb. butter.
Actual average, 337 lb.

During the past three years, 559 cows have been tested altogether (not including Government stock in 1917–18); and of these, 467 (83 per cent.) have reached the standard set for each age-class. It seems evident, therefore, that if any revision of standards is made, it should be to make them higher, certainly not lower.

### Herd-testing Associations.

The auxiliary of the herd-testing movement among owners of pure-bred stud stock is the testing carried out by means of co-operative associations amongst dairy farmers. One of the main purposes of the Pure Bred Cattle Breeders' Association is to demonstrate the maximum yields of stud cows, and that heifers bred from them on certain lines are liable to reproduce these high-production qualities; also that bulls bred from approved sires and select dams have the capacity of begetting offspring equally as good or better than the foundation pure-bred strains through which they are descended. The object of those dairy-farmers who are testing their herds is to ascertain what every cow is capable of doing over a period of twelve months under normal conditions, in order to be able to know with a fair degree of certainty whether each is producing enough to be a payable proposition. In this case

the cost of feeding has to be such that a sufficient margin is left to yield a profit between expenses and gross return. This is not so important with the breeder of stud stock. He expects to make most profit out of the sale of his young stock, and he knows that the greater the production of the strain he breeds from, the bigger will be the prices he will obtain for his heifers and young bulls—so that in some cases it will pay to get the high production records by feeding at a cost that would otherwise be prohibitive.

Another object the dairy-farmer has in testing each cow is to see if the heifers bred on the farm are an improvement on their dams—in other words, to put the herd sire on trial. And it is here that the advancement of these testing units is of special interest to the members of this association, for by their means it is being daily proved that if improvement is to be looked for with certainty in the farmers' herds, a pure-bred bull from high-testing stock must be used. To repeat what was said in the report presented in 1918, when writing of these two branches of the testing movement: "While they are separate movements they are inter-dependent, for the more the benefits and principles of testing are grasped by the average dairy-farmer, the more he recognises the value of heredity and the keener he becomes to possess a bull which, besides being pure-bred, is able to prove that he is descended on both sides from high-producing strains, and that he possesses the ability to pass those production traits on to his descendants." In view of this, some brief mention of the present position regarding the testing of the ordinary dairy herds will not be out of place in this report. Up to 1st March, 1918, some 55,000 records of individual cows had been made. At that time the work was being carried on with only one unit—1,400 cows strong—because of the war. Efforts have been made since to revive the suspended associations, and during 1919 some 4,000 cows were tested in three units. At the present time there are six units operating under the direction of the Tweed-Richmond Herd-testing Council.

In addition, the butter factories in the Bega district have recently taken the matter up, and there is already one full unit (twenty-five members) at work under the guidance of a local butter factory's directors, and very shortly another, equally as strong, should be operating through a neighbouring co-operative dairy company.

These eight units should test between them this year about 8,000 cows—an appreciable increase from the figures of three years ago. The revival would have been greater on the North Coast but for the dry season that district has just gone through, and for the continuance of the drought in the western districts, which has prevented the sale of surplus young stock on the coast to big inland stock-raisers. The whole of the coast is over-stocked, and only a good season west of the mountains will better the situation. Under these circumstances, dairy cows are milking under bad conditions as regards feed, and the prospects for the coming winter are not too bright. This has been a big factor in retarding the greater expansion of herd-testing amongst dairy farmers there.

# Three Native Beetles attacking Orchard Trees.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

THE following notes have been written to illustrate the damage that three of our forest beetles have caused in orchards during the last six months. The photographic illustrations will give a very good idea of the nature of the damage caused by each species. Mr. T. McCarthy, who visited the infested areas and carried out the field investigations, proposes to deal with their development and life histories, when he has finished his studies of their habits.

The average orchardist usually waits until the insect pest has done all likely damage to his trees or fruit before he claims the assistance of the entomologist, whereas some measure of control in the first stages of infestation would probably have killed or driven away the invading insects before very much harm had been done. A few suggestions applicable for next year's probable infestation may nevertheless be welcome.

**The Shining Green Cockchafer** (*Anoplognathus chloropyrus* Drapiez).

This beetle was figured and described by Drapiez from New South Wales in 1819, in a Belgian journal.

It belongs to a typical group of our Coleoptera, which comprises a number of large handsome lamellicorn beetles, usually reddish brown, biscuit brown, or richly metallic. They often appear in the early summer in immense swarms, and clustering over the foliage of trees and shrubs soon denude them of every leaf. Most of them confine their attentions to the native vegetation. I have seen this species in countless thousands covering the tops of the young gum trees on the ranges in the Bathurst district, where they are more or less in evidence every summer. Though in this instance the damage is caused by the perfect insects, in other cases, under suitable climatic and soil conditions, it is the active grubs or larvæ that are the pest. These are the large white grubs often turned up when digging in the suburban garden. The larva of an allied species (*Anoplognathus analis*) was described and figured in the pages of this *Gazette* in 1901, as a serious pest eating off the roots of strawberry plants at Castle Hill.

Dorsal view of the Shining Green Cockchafer Beetle.


Foliage of Plum Trees eaten by the Shining Green Cockchafer Beetle (*Anoplognathus chloropyrus*).

These beetles are popularly known as "cockchafer beetles," though they differ somewhat in structure from the common British cockchafer. In the case under observation, they last season swarmed into the orchard at Sutton Forest, and defoliated a large number of plum trees.

The illustration shows the general form of the beetle, which measures 1 inch in length and is broad in proportion. The upper surface of the head and thorax are a rich metallic coppery red, the wing covers are light biscuit brown, with the undersurface metallic green and reddish, clothed with fine grey hairs scattered over the undersurface and fringing the sides of the legs.

### The White Striped Weevil (*Perperus insularis* Bohm).

The genus *Perperus* contains a number of small greyish brown weevils that have a wide range over Australia, two of which at least are well-known orchard pests in New South Wales. In the early part of the summer they emerge from the soil where they have pupated, and crawling up the tree trunks just as the leaf buds are bursting, set to work and eat the centre out of each bud as they work along the branches. In the pages of this journal in 1898 the writer described the damage caused in this manner by *P. insularis* in the Gosford district, where the methods of control adopted—hand picking, and shaking the branches over a sheet placed under the tree at night—soon reduced the pest.

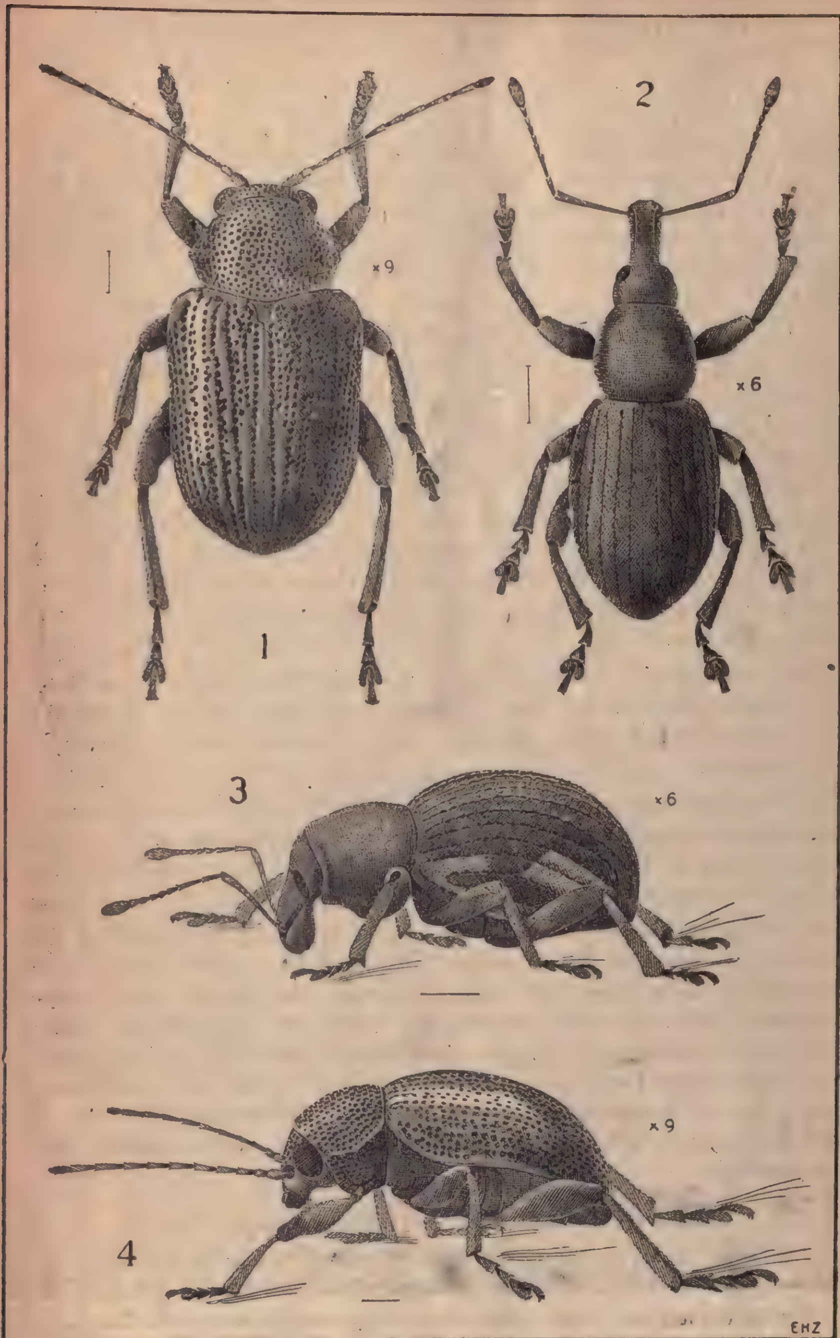
The second species (*P. innocuus*) did a considerable amount of damage in the Fairfield district to the fruit trees, and in the Maitland district attacked and punctured many grapes just as they were ripening, as well as damaging the leaf buds.

In the present case, the White Striped weevil has taken a new departure, attacking the young branchlets of some small citrus trees and not only stripping them of their leaves but denuding them of their bark, and giving the infested trees a very serious setback.

If similar methods to those of years ago had been adopted at night to clear the young citrus trees as soon as the first sign of their presence was noticed the damage might have been greatly reduced. An inverted funnel-shaped bandage of stiff oiled paper, fixed tightly round the tree stem just clear of the ground, would have trapped large numbers, when they could have been very easily collected and destroyed every morning. Some writers recommend spraying with arsenate of lead, but where the beetles are numerous and hungry, though they eventually die, they have done all the damage before that happens.

### The Pitted Apple Beetle (*Geloptera porosa* Lea).

This beetle, which has appeared in the Gosford district in large numbers and damaged the young apples by gnawing off patches of the skin, as shown in the accompanying illustration, has not previously been recorded as an orchard pest. Specimens sent to Mr. A. M. Lea, of the Adelaide Museum, were identified by him as this beetle.




**Native Beetles that Attack Orchard Trees.**

1. Dorsal view of the Pitted Apple Beetle (*Geloptera porosa*). 2. Dorsal view of the White Striped Weevil (*Perperus insularis*). 3. Side view of the White Striped Weevil. 4. Side view of the Pitted Apple Beetle.


Twigs of Young Orange Trees damaged by the White Striped Weevil (*Perperus insularis*).

It is a typical member of the family *Chrysomalidæ*, which contains so many of our foliage-eating beetles, and until found in the apple orchard, it was a comparatively rare insect in the bush. Nothing is known about its life history, but like many allied forms its larva is a plant-eating grub, and probably pupates in the soil. Most of the species of this genus previously described are more or less tropical in their distribution.

The beetle measures a quarter of an inch in length. The eyes are black and projecting on the sides of the head, which is sharply turned down in front. The head, thorax, and abdomen are rich reddish brown; the deep pitting of the dorsal surface is finest upon the head and thorax, and greatly intensifies the metallic reflections from this surface; the head and thorax are darkest. The legs and antennæ are brownish yellow, the swollen femora (thigh) of the hind legs being a rich metallic yellow.


**Apples damaged by the Pitted Apple Beetle (*Geloptera porosa* Lea).**

The damage caused to the apples is very much like that done by a richly metallic green lamellicorn beetle (*Diphucephala colaspoide* [illegible]) n in Victoria and Tasmania, where under normal conditions it feeds upon the black wattle scrub, from which it migrates into the adjoining orchards. French figured and described it ("Destructive Insects of Victoria, Pt. II, 1893") under the name of the Cherry Green Beetle. He recorded it damaging ripe cherries in Victoria, but the writer has seen it about New Year gnawing the skin off the apples in the vicinity of Hobart.

Spraying with arsenate of lead would kill these beetles, but if they rest on the apple trees through the night, they can be very effectively dislodged by jarring the branches in the early morning, when they are in a semi-torpid condition. They can then be collected on a sheet previously placed on the ground under the tree.

# Safeguarding Farm Stock from Disease.

## (1) Preventing the Introduction of Infection.

[Continued from page 344.]

MAX HENRY, M.R.C.V.S., B.V.Sc.

### Infection from Clothing, &c.

The second means by which infection can be brought on to a farm or station is the clothing and boots of persons who visit infected premises and then go on to healthy ones; but any utensils, vehicles, forage, or anything used in connection with infected stock, or produced by infected stock, can, under certain circumstances, act as a medium for the introduction of disease. The most important diseases so disseminated are anthrax, swine fever, and tuberculosis. Anthrax has in some countries been introduced on to many farms through infected forage or bonedust, but neither of these means of dissemination has been shown to be common in this country, since nearly all our outbreaks occur under circumstances which eliminate the possibility of such infection. The custom of destroying anthrax carcases or suspicious carcases by fire or deep burial without opening is also responsible, without doubt, for some of our immunity from such methods of infection. Swine fever may be taken from piggery to piggery on boots and clothing, but such must not be looked upon as the common method of spread. Still, a pig farmer is well advised to keep away from piggeries where swine fever exists or is suspected to exist.

One source of infection of pigs and calves with tuberculosis is the custom of feeding these animals on skim milk or other milk products from a creamery or butter or cheese factory. The milk products from a number of herds are mixed there and a few tubercular herds may contaminate the lot. Such milk products should be boiled before being fed to young stock.

### Contamination from Uncontrolled Agencies.

Under the third heading come certain uncontrolled and almost uncontrollable agencies in the spread of disease which deserve notice but cannot be regarded as operating with great frequency; such agencies are flesh-eating birds, dogs, and flies. It has been shown, for instance, that the dog is much more resistant to anthrax than many other animals and that he can consume anthrax meat without necessarily becoming affected, and yet, at the same time, pass out anthrax bacilli with the fæces and thus infect other stock. This is but one among several reasons why stray dogs are a nuisance and a danger, and if the possibility is borne in mind of the dog's near relatives, the dingo and the fox, sharing this resistance to anthrax, it will be obvious that we have an agency in the spread of disease very difficult to control.

Fowls are also resistant to the disease, and in South America the vulture has been declared capable of spreading anthrax through the injection of anthrax meat and the voidances of the spores in the fæces. The probability is that this resistance is shared by many others, including our own carrion-eating birds. It would be possible, in the case of neighbouring piggeries, for birds to carry bits of garbage and food from an infected sty to a clean one.

Flies have been accused, with apparent good reason, of acting as occasional carriers of anthrax bacilli and swine fever virus, and this furnishes another reason for their destruction.

### By Infection during Temporary Absence.

Very few of our diseases are liable to be contracted under ordinary conditions by an animal when temporarily off the farm, but one at least of these few is of great economic importance—that is, contagious abortion. This may be brought back to a farm by a bull loaned to a neighbour or a cow sent to a neighbour's bull for service. These are always dangerous practices in districts where contagious abortion is rife, but they are often unavoidable, and extra care should be taken with such animals on their return. The bull should have his sheath well syringed out with mild disinfectant and his belly washed with the same and be kept from the herd cows for a few days.

The same process should be carried out when cows are taken on to the farm for service. It is always desirable that such visiting cows should not mingle with the herd cows. Cows which may be served by bulls from other farms are a source of trouble, because such a long period may elapse before symptoms of abortion disease are evident, and isolation for such a period is at best a continued source of inconvenience and frequently impracticable. The safest plan is not to borrow the service of other bulls unless it is known that the farms on which they live are clean—not an easy matter.

Horses are always liable to contract strangles and influenza from contact with affected horses in public stables, and on occasion from public drinking places. Very little can be done to prevent such infection. Cleanliness and good ventilation in the stables will be of some avail.

### By use of an Infected Farm.

In the case of certain diseases (of which tuberculosis, anthrax, tetanus, blackleg, hæmorrhagic septicæmia, and spirochætosis of fowls are the most important) the farmer's stock may be infected by their introduction on to infected land or premises. Four of the above—tetanus, anthrax, blackleg, and hæmorrhagic septicæmia, the organisms of which diseases remain in the soil for long periods—can hardly be guarded against by any general measures, except that in the case of blackleg, if certain farms or portions of farms have a bad reputation, the use of such areas for cultivation is recommended. There are in most centres, wherein grazing is carried out on a large scale, certain areas in which anthrax very commonly occurs, apart from the sporadic cases due to forage and bonedust infection. Such outbreaks are due to soil infection. These areas are generally well known

locally, and farmers on such land are well advised to take the precaution of having their stock vaccinated against the disease if there have been in their neighbourhood any recent outbreaks. The bacilli of tetanus have been shown to exist in the fæces of healthy animals of many kinds, and almost any well-manured garden soil may contain these organisms, although certain countries and districts appear to be more particularly infected in this way than others. The species most commonly attacked with tetanus are horses and sheep, and in the vast majority of cases infection takes place through wounds. Any wound in the horse, especially a deep, punctured one and a wound in the feet, should be very thoroughly cleansed of all dirt, disinfected, and free access of air allowed to it.

In sheep and lambs tetanus usually occurs as an epizootic a short while after cutting and tailing, or shearing. To prevent this, care should be taken that all knives and instruments used are clean, and do not come in contact with dirt during the operation. The wounds should be dressed with carbolic sheep dip, Stockholm tar, or suitable disinfectant, and the sheds and yards, particularly the latter, must be clean. In the case of old yards this will often involve the removal of several inches of the surface layer of earth and manure, the spreading of chloride of lime, and the laying down of a fresh layer of clean soil from some part of the run which has not been used as a camp or yard. Blackleg is not a contagious disease either directly or through intermediary objects, but is due to infection from the soil, and there is no way of ascertaining whether a farm is free from the disease or not except from its previous reputation. If it is known that a farm is liable to blackleg, all young cattle should be vaccinated at about the age of six months, but absolute prevention of the disease is doubtful. No other animal except cattle is likely to suffer, though rare cases have occurred.

The contraction of tuberculosis from soil comes within a somewhat different category to the above complaints, as the soil infection is due to direct and more or less recent infection by manure from diseased cattle and pigs. It is naturally more liable to occur on small farms where cattle are closely confined, but here also preventive measures, which consist in breaking up the manure to thoroughly expose it to the sunlight and in the putting under cultivation of the more probably infected portions, can be most readily adopted.

As hæmorrhagic septicæmia is also a soil disease the same disabilities as regards prevention exist as in the case of tetanus or anthrax. Spirochætosis of fowls—an infectious disease spread by the fowl tick—may be contracted by the birds if they are brought into infected premises. They can, however, be safeguarded to a great extent by thorough cleaning of the fowl-houses, spraying with kerosene emulsion and confining the fowls to the houses at night. If the ticks are kept away, it will not matter if some of the older fowls contain the organism of the disease, since it can only be spread by the ticks.

It may be desirable to explain a little fully what is meant by isolation, as so often cases are met with in which the farmer is convinced in his own mind that he has perfect isolation, and yet he is really allowing loopholes for the

entrance of disease; a wire fence between two paddocks does not constitute isolation. In the case of pigsties, yards sufficient to accommodate any batches of pigs likely to be brought on to the place should be erected at a distance from the pigsties and in such a position that drainage from the sties cannot reach the isolation pens nor vice versa. This isolation pen should not, if possible, be entered by the men looking after the pigs if there is or has been recently any disease among the pigs already on the farm. So far as cattle are concerned, the isolation paddock should, if possible, be separated from the ordinary cattle paddocks by a cultivation paddock or by a fenced road, or some other space to prevent the two lots coming in contact over the fence.

If milking cows are being isolated they should have separate bails. For fowls, some provision should be made apart from the runs and pens, in which the birds can be kept until the purchaser is reasonably satisfied that they are healthy.

It may be said with justice that the above are platitudes; but in actual experience it is found that the simplest methods of preventing the introduction of disease are widely neglected, and in view of this and of the number of men who know very little about stock and nothing about stock diseases who are now going on the land, it has seemed desirable to draw attention to the matter. It is recognised that many farmers commencing their work on uncleared land have so many jobs that claim priority that some of the measures indicated are not practicable for the time being. When firmly established, however, it should be possible for farmers to take some such steps to safeguard their stock.

(*To be continued.*)

## Kale for Supplying Green Feed to Poultry.

The supply of green feed for poultry is often short during the winter months, and kale is a plant that will furnish greenstuff which will be relished by all poultry and pigeons; sown in February it will produce plants from which a quantity of green succulent leaves may be gathered during the winter, while later sowings can also be made which will secure a supply in the early spring months. I have found kale capable of producing greenstuff throughout the year, but it is at its best during the winter months. The variety grown was Sutton's A1 Scotch Kale, which is an excellent table variety.

As the plant grows, a number of loose curled leaves are produced from the stem, and are removed for use as they mature. Regular removal induces the growth of fresh leaves, though at no one pulling should all the leaves be removed. Once established, kale is remarkably hardy, and cabbage moth does not appear to be troublesome. A patch of a hundred plants should assure a good supply of green feed for a number of fowls.

The plants are best set out at a distance of 3 feet by 2 feet in rows. They will stand liberal manuring, and poultry or pigeon manure will be found especially valuable. Where neither poultry, pigeon, nor farmyard manure is available a mixture of equal quantities of superphosphate and blood and bonedust, applied at from 3 to 4 cwt. per acre, will be found useful.—R. N. Makin.

# Neutralisation of Cream.*

L. T. MacINNES, Dairy Expert.

The Department of Agriculture has, since 1914, devoted much attention to the investigation of the neutralisation of acidity in cream and milk. The general adoption of pasteurisation by New South Wales butter factories in 1916–17 made a knowledge of neutralisation compulsory for our factory managers and butter makers, as the quantity of cream received of acidity low enough to be pasteurised without this process was not sufficient. The average acidity of the cream delivered during the colder half of the year would be from ·3 per cent. to ·35 per cent., while during the warmer season it would range from ·4 to ·5 per cent., and at times higher. Taking ·2 per cent. as a mean average acidity at which to pasteurise with good results, it will be seen that reduction in acidity—varying in degree—is required throughout the year. In making this reduction the greatest care is required, and everything connected with the taking of acidity tests should be done with exactness.

The alkali solution used should be of the required standard, and its strength checked from time to time. Each vat of cream to be treated should be first well blended and then sampled and tested to ascertain the amount of acidity present. After thoroughly mixing with it the neutralising agent used, a second sample should be tested (say fifteen minutes after the commencement of the process of neutralisation) in order to check the work being done.

### Want of Method in Factory Procedure.

At each of the nine or ten dairy schools for butter factory employees annually conducted by the Department (at which there is an average aggregate attendance of 120), instructions are given as to the making of these tests, and students are shown how to ascertain the strength of the alkali solution used. Not only at these schools but at factories throughout the year the staff of the Dairy Branch is continuously impressing on all concerned the necessity of exercising the greatest care in determining the amount of acidity present. In spite of this, however, there is still too much guess-work and a lack of method in factory procedure. Often the acidity of the cream is arrived at by basing it on that of yesterday, and even where tests are made daily the operator is frequently content with testing the first vat to be neutralised and using that test to calculate the amount of acid present in all succeeding vats treated on that day. The average employee in a dairy produce factory does not seem to be able to grasp that the smallest variation—even one-hundreth of 1 per cent.—from the correct

* Science Bulletin, No. 17, Department of Agriculture, New South Wales. "Neutralisation of Cream: Rate and Amount of the Reaction in 'Flash' and 'Batch' (or 'Holding') Pasteurisers." A. A. Ramsay, Principal Assistant Chemist, Department of Agriculture.

estimate of the acidity of a large quantity of cream makes a difference in the amount of neutraliser to be added, while one-twentieth of 1 per cent. variation in 600 gallons of cream would make a difference of about 3 lb. in the amount of soda that would have to be used to reduce the acidity from ·5 per cent. to ·2 per cent. Over-neutralising, whatever the kind of neutralising agent used, is mostly caused by this looseness or want of method. One of the most important aids to the advancement of the quality of our dairy products would be the better scientific training of those working at the factories, enabling them to have a thorough insight into laboratory methods and to realise the absolute importance of being exact in every detail and of leaving nothing to chance.

In connection with the pasteurisation of cream as carried out in New South Wales, the importance of ascertaining with accuracy the temperatures to which the cream is heated cannot be too strongly emphasised. No thermometer should be used unless it has previously been checked for correct reading. Unfortunately there has been on the market a class of dairy thermometer, samples of which when tested have been found to be inaccurate and as much as 10 degrees "out." Such an error in temperature would mean the difference between making a good or bad keeping butter, or between a good or bad flavour even in that freshly made. This overheating of cream is a frequent cause of inferior butter being marketed, although in some cases the flavour arising from it has been attributed to over-neutralising.

The investigational work commenced in 1914 by the Department has been carried on from time to time by the Chemist's and Dairy Branches, and the results have been made available to those interested as soon as possible. The investigations now under discussion were commenced by Mr. Ramsay in October, 1918, at the request of the Dairy Branch, and the factory work was brought to a close in February, 1919. The results were written up by the following May, but publication has been delayed by various circumstances. They now appear in the form of this Science Bulletin.

### Results of Experiments in Brief.

The results obtained at the different factories visited, where methods of neutralising and pasteurising were dissimilar, varied considerably; this was especially noticeable where different sized pasteurisers of the "holding" type were used. In such cases neutralisation was found to be irregular and faulty where the vats were filled to cover the heating coil by several (in some cases 8 or more) inches of cream, and where there was a large space between the coil and the sides and bottom of the holding vat. In these machines the coils are of practically uniform diameter, irrespective of the breadth or depth of the vat into which they are fitted. It was found that the most efficient mixing of neutralising agent and cream was effected in the 500-gallon sizes, where the coil fitted close to the walls and bottom and where the cream did not quite reach to the top of the coil or barely covered it.

Complete and quick mixing is essential to good results—and this holds good whether lime or soda is used, and under either the flash or holding

systems of pasteurising. The assertion previously made that sodium bi-carbonate is quicker in its action than lime is verified by the results of these investigations under the flash pasteurising system, although after fourteen hours the neutralising force of both had been practically expended; it was also ascertained that after the first few hours the additional amount of acidity neutralised by both of these agents was very small. In those cases where the percentage of acidity registered showed an apparent increase contrary to expectation (No. 3, Series B), not only was the mixing of the neutralising agent with the cream inefficient on account of the structure of the cream vat, but in addition and apart from the presence of carbonic acid gas ($CO_2$), it is considered that the overfilling of the vat was a prime cause, as this placed an obstacle or blanket of some 8 to 12 inches of cream above the coil, thus holding captive the gases seeking to rise to the surface and escape. Where the quantity of cream put in was just sufficient to reach to the top of the coil or leave it partially exposed, the abnormal condition of the acid registering an increase instead of regularly decreasing did not take place. Leaving the coils slightly exposed is recommended. Care should be taken when adding lime cream or soda (especially the former) to have it well diluted, and to have it thoroughly and quickly mixed through the mass of the cream that is being treated. It is considered that while good results are obtainable in neutralising by both the flash and holding systems, the former can be credited with obtaining the more consistently good results. The assumption is that it is not the holding system that is at fault but the endeavour to make a standard coil—used for mixing, heating, cooling and aerating—fit vats of different shapes and capacities.

### Lime versus Sodium Bi-carbonate.

Experience has shown that cream neutralised by lime will make butter of a quality quite equal to that of butter neutralised by sodium bi-carbonate, and the use of lime as a neutraliser cannot, therefore, be condemned. The Department has, however, always cautioned users against the greater danger incurred where lime is added, and, since sodium bi-carbonate has once more come on the market in large quantities and at a reasonable price (a minor consideration), has recommended the use of the latter in preference. There are several reasons for this. Compared with lime, soda is constant in strength and less liable to bring about a change in the butter-fat; lime, even from one kiln, cannot be relied upon for such consistency. The action of lime is also more enduring than that of soda, and greater care in adding it to the cream and in taking the acidity tests is required.

In order to assist butter manufacturers to get more accurate results an arrangement was made with a firm of manufacturing chemists in Sydney some months ago, whereby the firm agreed to put up a standardised sodium bi-carbonate in cartons of various sizes, each package to contain sufficient to neutralise 1 per cent. of acidity in 100, 300 or 500 gallons of cream respectively. If the acidity has to be reduced by 3 per cent., three packets of the size required will be necessary. Each of these packets will be plainly labelled to show the weight of soda contained and how much acidity it will

neutralise in a stated quantity of cream. It is understood that the firm is willing to place soda, put up in this way, on the market at the same price as that charged for it in bulk.

The similar standardisation of lime has not been considered on account of the reasons that exist against its use.

Experiments are now being carried out in the neutralisation of cream pasteurised under both the aforementioned systems, with mixed sodium bicarbonate and lime in varying ratios. The results of these trials will be made known to those interested in the course of a few weeks.

Cream containing over ·25 per cent. of acidity should not be pasteurised by the flash system because of the risk of curdling, &c., nor below ·18 per cent. if trouble from over-neutralising is to be avoided. With the holding system this range can be slightly increased. It is preferable to limit it in both cases to about ·20 or ·22 per cent. Soda can be used with greater safety at the lower acidities (under ·2 per cent.) than lime.

## Some Recent Publications.

Copies of the undermentioned publications may be obtained by farmers, free of cost, on application to the Under Secretary and Director, Department of Agriculture, Sydney :—

- Science Bulletin, No. 17. Neutralisation of Cream : Rate and Amount of the Reaction in "Flash" and "Batch" (or "Holding") Pasteurisers. A. A. Ramsay, Principal Assistant Chemist.
- Farmers' Bulletin, No. 36 (Revised Edition.) Sorghum. A. H. E. McDonald, Chief Inspector of Agriculture, and E. Breakwell, B.A., B.Sc., Agrostologist.
- Farmers' Bulletin, No. 88 (Revised Edition.) Fruit Preserving : Canning, Bottling, Jam-making, and Candying Peel. W. J. Allen and S. A. Hogg.
- Grasses for Different Districts.
- The Marking of Lambs (Revised).
- Diseases of Lambs Incidental to Marking.
- Rearing and Feeding Poultry.
- Fruitgrowing under Irrigation (Revised).
- The Banana (Revised).
- Tank Sinking (Revised).

## The Care of Honey when Stored.

If honey is stored in a damp place, and not thoroughly sealed up, it will absorb moisture, and if excessive moisture is so taken up the honey is liable to ferment and deteriorate in value. Do not leave the lid off the containers, or leave honey exposed for any length of time during the late autumn and winter months. If kept in a dry place in a sound container honey will keep good for years; it may granulate, but that is not a sign of deterioration, and in such case it may easily be liquefied by immersion of the container in hot water. Honey containing excessive moisture, in contact with the atmosphere and in a tinned container, will often be stained, as the liquid then has a tendency to absorb some of the tin—an event usually indicated by a dark streak. Let the apiarist have his honey well ripened naturally by the bees and stored in a sound container in a dry place, and he will experience no trouble.—W. A. Goodacre, Senior Apiary Inspector.

# Treatment of Extracted Honey.

W. A. GOODACRE, Senior Apiary Inspector.

HONEY when first drained from the honey extractor contains a certain amount of wax pieces; it is, therefore, advisable to have a strainer fitted to the top of the honey tank. The honey is then strained before entering the tank. When the tank is filled it should be securely covered, and a sound piece of cloth put over the lid and fastened by strong string twitched tightly round the ledge; this offers protection from insects or stray ants that might happen to gain access to the tank—the lid itself rarely fits as tight as is desirable. The tank being thus filled and securely covered, the honey should be allowed to remain for about four days, during which time it will clear and will also go through some ripening process by evaporation of moisture.

At the end of four or five days, if care has been taken in the first instance to have the honey well sealed by the bees, the apiarist will have a clear, refined product that has, in the first place, been ripened by the bees, then strained and allowed to clear, and further improved by ripening in the tank. If, during warm, dry days, the apiarist is working about the honey house, a further improvement in the ripening will take place if the covering is removed from the tank for a time. Of course, this is not practicable if there is any chance of bees, &c., getting into the honey. The covering should be replaced towards afternoon.

When preparing to tin off, the honey should first be skimmed and then drained off into the containers in which it is to be marketed. When the honey is low in the tank, the apiarist can tilt the tank towards the tap; this will allow a further quantity to come out clear. When all the clear honey has been tinned off, the remainder, which will contain a certain quantity of wax pieces, can be drained into a small vessel with a honey gate at the bottom; this honey, if warmed, will clear quickly, and can be tinned off down to the wax pieces, which are in the form of scum.

The above is the usual and effective method for the treatment of extracted honey. In some cases it is desired to heat honey for the purpose of giving it a brighter appearance and extra density, and also for blending purposes. The question of heating honey is best left to the individual apiarist, who will be guided by the taste of his customers, or the quality desired for market. Honey that has gone through a correct heating process will no doubt appeal to many on account of its appearance and density.

### Heating Extracted Honey.

The correct time for heating honey largely depends on when the apiarist desires to dispose of his crop. For instance, if the honey is to be sold within a few weeks, it will be advisable to combine the heating with the extracting

work, but where it is intended to hold for an improved market (usually the winter) it is advisable to wait until near the time of dispatch, for the honey may granulate while in store even after the first heating, and it is then necessary to heat it again. This double heating process is likely to deteriorate the quality.

The method used for heating liquid honey depends on the extent of the production. If the apiarist is working on a fairly large scale and desires to market early, it is advisable to install a patent honey heater, which can be purchased. The object is to run the honey from the extractor through this apparatus, and to heat it to about 150 degrees Fah. before it goes into the tank. After such treatment the honey clears very quickly and is less likely to granulate within a fair period.

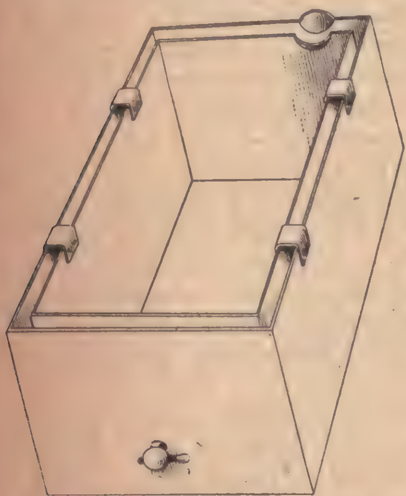


**Fig. 1.—Small Double-Walled Vat for heating extracted honey.**

A simple type of honey heater that would be useful to the small apiarist is a double-walled vat, consisting of two plain single vats, one being made small enough to fit inside the other, allowing a space or cavity of $1\frac{1}{2}$ inches all round and underneath. When fitted these two vats can be stayed so as to hold each other in position. A honey gate should be fitted to pass through from the outside, so that the honey can be drained from the inside. Fig. 1 gives some idea of the construction. At the top of the figure is represented a small cup, by means of which the water is poured into the cavity.

The outside vat can be made of galvanised sheet-iron, and the inside one of tinned iron. A cavity-walled vat of this type, with a capacity of about 120 lb., can be set on blocks in the honey house, and when extracting is proceeding the cavity can be filled with hot water. After it has been ascertained by test that there is no leakage, the honey is poured into the inside vat and a primus or blue flame lamp will supply the desired heat, which should not rise above 150 degrees. To ensure that the heated water shall circulate and the heat not be confined to the one spot, the flame should be kept at a fair distance from the bottom of the vat. As soon as the honey is heated it can be drawn off through the gate or tap. If the extractor has a large capacity the honey can be run direct into the heater when the limit of the capacity of the extractor is reached, though to do so the extractor must be elevated a few feet to allow the honey to gravitate.

## To Liquefy Granulated Honey.

Although it is quite possible to keep honey in a liquid form for a fair period by storing it in a warm room kept at an even temperature, there appears to be no practicable method that can be classed as an absolute preventive of granulation. Some honey has a tendency to granulate more quickly than other honey. For instance, in New South Wales the honey from the peppermint (*E. amygdalina*) will readily granulate, while that from yellow box (*E. melliodora*) and ironbarks will usually remain liquid for a considerable

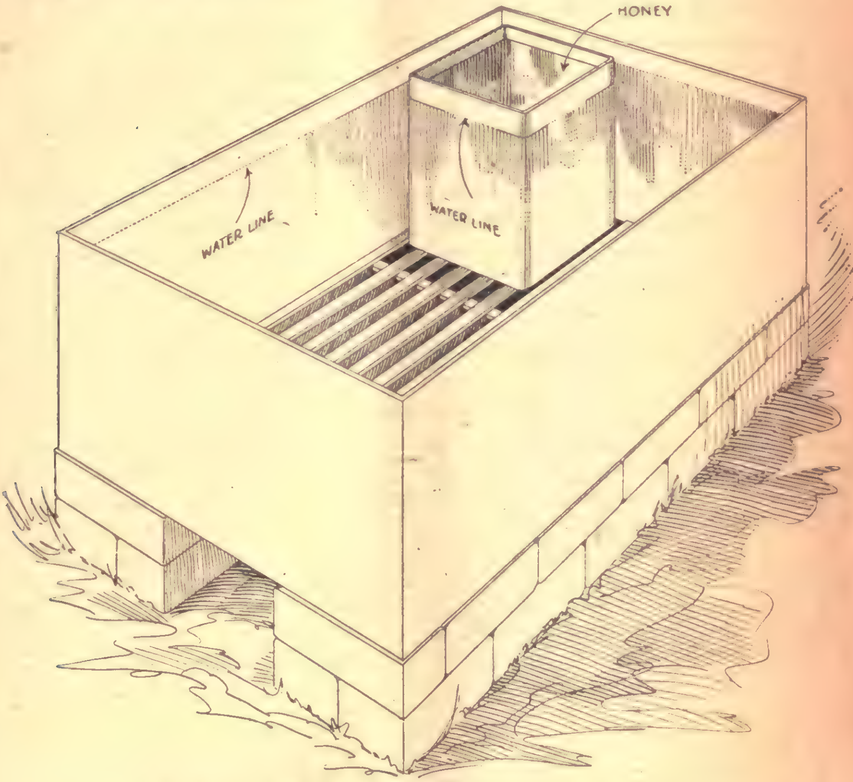



**Fig. 2.—Vat in which tins of Granulated Honey can be Liquefied.**

period. Some honey will granulate with a coarse grain, while other will have a grain as fine as icing sugar. Clover and lucerne honey has a very fine grain when granulated (candied), while that from some of our eucalyptus gums has a coarse grain. Generally the better the quality the finer the grain. Granulated honey can be liquefied by immersing the tin in water heated to 150 degrees Fah., and if the operation is carefully carried out the quality is not deteriorated materially in this first heating.

Where a small quantity is to be treated, a single-walled vat to hold six or eight tins can be set up on bricks so that a fire can be placed underneath (see Fig. 2). A wooden frame is placed in the vat to prevent the containers from

coming in contact with the bottom, and water is poured in to about 3 inches from the top of the containers. The water should not be heated above 150 degrees—about what one can bear the hand in for six seconds. Semi-granulated honey can be liquefied in about six hours, while hard granulated honey will take from twenty-four to forty-eight hours. Care must be taken when handling honey in this vat, not to depend on the handles of the containers, but to have a few holders made so as to fit right round the tin. Another thing to remember when honey is to be stored for a period that may allow it to granulate again is not to fill the containers right up, for during the heating the honey will expand.

When larger quantities are to be liquefied it is advisable to have a small steam boiler and a vat to hold about fourteen to sixteen tins. A pipe will deliver the steam into the water in the vat to keep up the temperature; this is regulated by a steam cock to supply the desired volume. The usefulness of a steam boiler on a large apiary cannot be overestimated, and second-hand ones are often obtainable at no great outlay. Steam can be supplied for keeping the water hot in the cappings reducer, cleaning honey tins, and melting up wax and old combs. It is also an economical power if an engine is fitted for sawing purposes, &c.

## Another Combined Spray.

A combined spray consisting of red miscible oil and washing soda has been gaining in popularity in coastal districts of late, growers finding that it acts well provided it is not used when the weather is very hot nor when drought conditions prevail.

Commenting on the mixture, the Fruit Expert writes:—"The soda is added to the oil to make the spray effective against white wax. It has been used a good deal in the Gosford district during the last two or three seasons, but after the erratic behaviour of miscible oils on citrus trees in the past I would not care to recommend it. I still prefer the resin wash."

## Saunders' Case-moth (*Metura elongata*).

The cocoon of a caterpillar of which he had no knowledge except that it was infesting his garden in great numbers was recently forwarded by a correspondent for identification. The specimen was a cocoon of Saunders' case-moth (*Metura elongata*). The female of this species never comes out of the case; the larvæ are hatched in it and drop out through the opening at the bottom, when they immediately set to work and form a covering cocoon under the shelter of which they feed and grow. As they grow they add to the cocoon, and when full fed stop moving about and fix the cocoon to a twig. The female undergoes a complete metamorphosis in the cocoon. The male turns round head downwards and pupates, coming out a perfect active moth, and impregnates the female in the cocoon. When numerous they can do a good deal of damage to foliage.—W. W. Froggatt.

# Collar Rot of Citrus Trees.

C. O. HAMBLIN, B.Sc., B.Sc. Agr., Assistant Biologist.

COLLAR rot is found in many, if not all, of the citrus-growing countries of the world. It recurs fairly frequently in Australia, but, unfortunately, often escapes the notice of growers until serious damage has been done. It is with a view to calling the attention of growers to a prevalent disease that these notes are compiled.

Spores of the fungus (*Fusarium limonis* Briosi), after McAlpine.

Base of diseased tree showing "gumming" of the trunk (on the left).

Collar rot manifests itself most frequently by "gumming" on the trunk just above, or close to, the ground. In many cases if the area of gumming is examined the bark in the vicinity will be found dry and brittle. Trees may be attacked at all ages. When the young tree is attacked there may be chlorosis or "yellowing" of the leaves, especially on terminal twigs, but with older trees this yellowing may not appear until the tree has been nearly ringbarked at the trunk.

Constantly in association with the disease is a fungus parasite (*Fusarium limonis*), which first makes its inroads through an injury or through water-

logged bark. The spores which propagate the fungus can be washed down irrigation channels from previously infected trees, and can be carried on to the land in small amounts of soil. They may be adhering to nursery stock or soil, and in some cases are carried from tree to tree by the grower on implements. This can happen especially in treating diseased trees if care is not observed with the knife. In some cases tiny white tufts—the spores of the fungus—can be observed on diseased bark, but may not be very obvious.

The fungus parasite grows very slowly through the tissues of the trunk, and slowly, too, accomplishes the ringbarking of the tree if left unchecked. Sometimes a tree will set a fairly heavy crop before death. The decay proceeds upwards to the stem and downwards to the roots.

**Diseased trunk, showing bark removed from [illegible] affected area.**

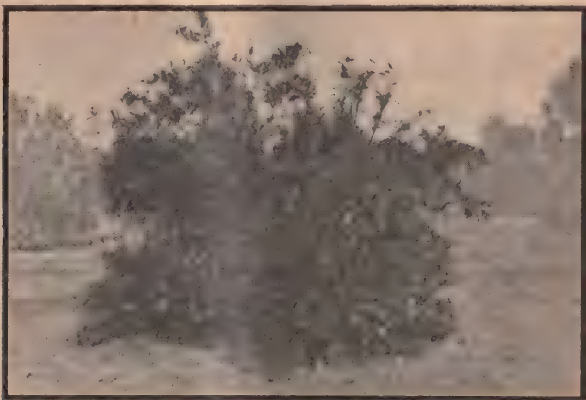
**A diseased tree, unhealthy bark removed; bluestone paste applied.**

The "union" of the tree is sometimes a point of entry, and so should be kept well above ground. Care should be taken to avoid injury to the bark of trees, especially with shovels and hoes when removing weeds. It has to be remembered that the condition is favoured and developed by bad drainage, while moistness of the soil in immediate contact with the trunk is also undesirable. Under irrigation conditions it is never necessary to run water right up to the tree trunks, and this should be avoided.

### Treatment.

Where "gumming" is observed the earth should be scraped away from the base of the tree and the whole of the dried bark apparently infected by the fungus should be cut away with a pruning knife, and the wound painted over completely with bluestone paste.

The bluestone paste should be prepared according to the following formula:—$1\frac{1}{2}$ lb. copper sulphate (bluestone), 4 lb. unslaked lime, $1\frac{1}{3}$ gallons of water. The lime should be slaked and brought to a pasty condition with portion of the water; the bluestone should be completely dissolved in the



A diseased tree dying with "collar rot."

remainder of the water, after which the two solutions should be mixed. If the paste dries a little on standing it should be brought to the necessary thinness again by the addition of a little more water. It may be an advantage, instead of replacing the contaminated earth, to put a little clean sand around the trunk after completing the treatment.

A healthy tree in the same block.

In cases where collar rot is too far advanced for the tree to be saved by this treatment it should be removed and burned, and the stump hole then dry-limed before replanting the gaps. In such cases it would be advisable to paint the new tree with bluestone paste around the "collar" prior to planting.

# Poultry Notes.

## JUNE.

JAMES HADLINGTON, Poultry Expert.

PERHAPS at no time in the history of poultry farming in this State have the prospects for supplies of poultry food been more precarious than at present. This is only too well known to most of those engaged in the industry, and there is, therefore, no necessity to enlarge on that aspect of the situation. However, poultry farmers may be assured that nothing that the Department might do will be left undone in the endeavour to meet the conditions that have arisen and to make whatever provision lies in its power.

### Confidence in the Industry.

Notwithstanding the gloomy outlook in the matter of food supplies, there is still confidence in the industry amongst those who know it best. This becomes evident when poultry farmers who have had many years' experience and who run large flocks for egg production are found buying up pullets from less fortunate or less experienced poultry keepers, paying 9s. to 11s. per pair for pullets that one can only class as medium to poor prospective producers. The men who are doing this know their business so well as to leave no doubt that they expect to make a good return on their investments. Not only so, but a really good class of pullet is not obtainable from well run farms, except at stud-bird prices. What all this goes to prove is that the men who are financially sound and who have the necessary experience to get the best results from their flocks intend to hang on, knowing they will probably come out on top in the end. It is the small farmer with no capital or insufficient experience upon whom the present conditions will weigh heavily and who perhaps will be driven out of the industry.

### Self Help.

There are two ways in which the poultry farmer may endeavour to help himself just now. The first is by carrying only such stock, both in quantity and quality, as he can feed with profit, or at any rate with the minimum of loss; the second is by the whole of those engaged in the industry using substitutes for the present staple foods wherever possible. Every particle of such substitutes is equivalent to an addition to our limited food supply. Unfortunately there appears little or no prospect of cheaper foodstuffs—substitute or otherwise—because all food supplies have a tendency to rise in price in sympathy with the staple foods. But what we appear to be up against is not so much dear feed, as shortage of feed in any form. This, then, is where the use of substitute articles, although perhaps not cheaper, will not only assist us in tiding over the crisis, but will keep prices from soaring to the height they might otherwise reach.

To turn to the present possibilities, however, it will be remembered that during the feed crisis of 1915 a number of more or less available substitutes were suggested in these notes as likely to eke out to some extent the then meagre supplies of poultry foods; and more recently the attention of poultry farmers has been directed to the advisability of growing lucerne on their farms wherever water is available—as is now the case with a great number. The value of lucerne for feeding in the morning mash, both in its green state and also when made into hay and used as chaff, was pointed out in these notes in February of this year. Many poultry farmers have responded to the advice there given, but it is safe to say that hundreds of others could have done likewise with great profit to themselves, and could have thus permanently relieved the food situation to a considerable extent.

### General Food Substitutes.

In regard to the morning mash it is scarcely possible or advisable to attempt to make a food mash without the basis of it being either pollard or wheatmeal, together perhaps with bran. It would probably be better to feed mixed cereals alone than to make a mash without one or other of these, but a very good mash can be made containing only about 40 to 50 per cent. of one or more of those products.

For instance, if we take say, 45 per cent. of pollard, or pollard, bran or wheatmeal combined, and add 35 per cent. of chaffed green food, such as lucerne or barley, with 10 per cent. of coconut oil cake, 5 per cent. linseed meal, and 5 per cent. M.I.B. meat or Compo meal, we would secure a very well-balanced mixture for the morning mash.

Again, if we start with 45 per cent. pollard, or that article combined with bran or wheatmeal, and add 15 per cent. of good chaffed lucerne hay, another 10 per cent. in the green state, 10 per cent. coconut oil cake, 5 per cent. linseed meal, 10 per cent. millet meal (now available in Sydney), and 5 per cent. M.I.B. meat or Compo meal, another good mash would be secured.

Then again, oaten pollard or wheatmeal could take the place of pollard with very little alteration in the balanced nature of the mash, and yet again, boiled vegetables, such as potatoes, pumpkins, mangolds, &c., with the water drained away, might enter into the composition of the mash to the extent of 10 to 20 per cent. All these percentages should be worked on weights.

In regard to the evening feed, nothing as yet known can supplant wheat or maize or both as the cereal portion of the ration, but the meagre supply of these might be augmented by the use of grain such as oats, barley, or sorghum or millet seeds. Of the latter, however, 10 to 20 per cent. is sufficient, while oats might be used to almost any extent, either taking the place of wheat or maize, or in addition to them, preferably in the proportion of one-third of each.

It would unnecessarily overload these notes and make them somewhat oo technical, and perhaps confusing to the layman, to give the analytical compositions of each of these ingredients so that a balanced ration could be worked out to a nicety on these suggestions; and what is more, they could

in any case be only approximate without actual analysis of samples of each food to be used. Taking the general averages of the analytical and digestible constituents of each of the foods suggested, and in the proportion mentioned, the balance should be sufficiently near to conform to my usual recommendation of one to four and a half, or one to five, considered necessary for laying hens; nor is it absolutely necessary to be so precise in this matter, taking into consideration the fact that two individual birds might do equally well on a very much wider or narrower ratio.

Palatability is, however, a more vital issue, because if birds will not eat the food, even a ration balanced most exactly on the basis of chemical combination would be a failure, while a much inferior ration analytically, if palatably good, would produce better results. It should also be understood that to force laying hens to eat food that is not appetising to them will at once reduce the egg supply.

It is necessary to warn poultry keepers that the use of substitutes of which nothing is known in regard to their effect on poultry may lead to serious trouble. Cases have already come under the notice of the Department in which this has occurred.

### The Hatching Season.

Notwithstanding all that can be said on the food question, the advice given in last month's notes to "Hatch as usual" still holds good. In most cases, even where stock has to be reduced, it will still be advisable, so far as one can see at present, to go on with the hatching. Only a small amount of food is consumed by chickens during the first two or three months, and by that time it will have become apparent what kind of a harvest may be expected. In any case it is more profitable to feed pullets than old hens. Moreover, seeing that the profitable life of the farm flock is only two laying seasons, if a poultry farmer fails to hatch for one season half his profit-earning stock is lost.

## Hardwood as a Well Casing.

"I am in a position where I can sink a well through alluvial soil and get water at a depth of 36 feet. Bricks are unprocurable locally. Is it possible to get drain pipes 4 to 5 feet in diameter, and is it probable that they would be suitable for well casing with a few feet of bricks at the bottom to let the water in freely?" The question came from a central-western farmer.

Concrete pipes are procurable, the writer was informed, but his location would make their purchase from Sydney very costly. Under the circumstances, the well might be lined with 6 inch by 2 inch split or sawn hardwood, laid horizontally, halved together at the ends, and secured with another 3 inch by 2 inch fixed in each corner vertically. If a storage tank of 5,000 gallons would be sufficient for the purpose, a windmill, say 10 feet, on a 30-feet tower, with a 3-inch pump, would be sufficient to supply water for a small irrigation area or for watering stock.

The Department's Exhibit of Fresh and Preserved Fruit at the Royal Show, Sydney, April, 1920.

# Orchard Notes.

## June.

W. J. ALLEN and W. LE GAY BRERETON.

### Planting.

PROVIDED the soil is in good condition, well prepared and neither too dry nor too wet, the present month is a good time for planting all deciduous trees. The reasons for planting as early as possible after the trees are dormant were pointed out in last month's notes.

Care should be taken that the roots of the young trees are not allowed to dry out between the times of digging up in the nursery and planting. Any damaged roots should be removed before planting. The centre of the hole should be kept high and the roots spread around this small mound with a downward tendency.

Use moist fine surface soil for filling the hole, and see that this is worked in close and firm around the roots. When planted, the trees should be cut back hard before the buds burst. This is done in order to start the head between 15 and 18 inches from the ground; also because some of the roots have been lost in transplanting, and those that remain are not established and cannot be expected to maintain all the top grown during the previous season. A pamphlet on laying out and planting an orchard may be obtained free of cost on application to the Under Secretary and Director, Department of Agriculture.

### Pruning.

All deciduous fruit trees will be in fit condition for winter pruning this month. To make the best use of the season, it is advisable to work first on the stone fruits that make the earliest start in the spring, leaving the later starting pome fruit for subsequent treatment.

Some hints on pruning stone fruits were given in last month's notes. As the tree comes under very close observation during pruning, the orchardist should keep a close lookout for any pest or disease that may be attacking it, marking the tree for special treatment where necessary.

### Orchard Burners.

It is as well to draw attention again to the use of orchard burners; this is the cheapest method of disposing of the prunings. Directions for converting an old square iron tank into a burner were published in the *Agricultural Gazette* for June, 1918.

### Winter Spraying.

The annual winter application of lime-sulphur (winter strength), or Bordeaux mixture, for the control of peach leaf curl can be delayed until July, except in the case of early blossoming varieties, such as Bell's November, or Edward VII, which should receive their application now.

Though Bordeaux mixture is equal to lime-sulphur, if applied while the trees are dormant, for the control of peach leaf curl, the latter is preferred, as it also checks the spread of San José scale.

### Harvesting.

If prices warrant, it is well to lighten the load of orange trees by marketing the fruit that is coloured and up to size. Lemon trees should be gone over regularly, and any fruit picked that is fit.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*Have you considered the extension of your cultivated area in view of the reduction of live stock? Following any improvement in the weather and soil conditions, what methods of preparing land quickly for hurried sowings of wheat or other crops would you adopt to ensure a profitable crop? Under adverse circumstances practices become justifiable that are not the best in better seasons. Hence, catch-crop methods have sometimes to be adopted. What would yours be?*

*What methods of feeding sheep have you adopted during the past few months? How have you fed grain—by placing it in troughs or throwing it on the ground—and what quantity per head have you allowed as a maintenance ration? In the handling of the flock have you made any attempt to separate the weak from the strong animals, or the ewes with lambs at foot from those that remained empty?*

*Have you ever tried seeding wheat on a maize field without ploughing, using the disc-cultivator as a means of preparing the seed-bed?*

*Have you found winter spraying with lime-sulphur effective against erinose in the grape vine?*

*Which has given you the better results in the control of mildew in apples—winter spraying with lime-sulphur or with Bordeaux mixture?*

*Have you considered what substitute feeds for poultry could be grown in your district? There are many crops that would be of value in different parts of the State; what one should do well in yours, and what methods would you adopt of planting, harvesting, and feeding it?*

## DEMONSTRATION HIVE FOR BEE-KEEPERS.

Arrangements have been made for the loan to branches of the Agricultural Bureau of a complete hive, together with samples of bee-keeping material, with the object of enabling members interested in the subject to see the correct way of fixing the supers, &c. In addition to the hive, the collection comprises super frames, foundation comb, mailing cage for queens, &c. Full information will accompany the package. Applications (which should be addressed to the Under Secretary and Director, Department of Agriculture, Sydney) will be dealt with in the order in which they come to hand, and the material will be sent from one branch to another, the receiving branch in each case being asked to pay the small amount of the freight.

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.*

### Albury.

A packing demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 2nd March, and proved one of the most valuable demonstrations ever held in the district. Mr. Brereton also visited a number of orchards on the following day, and the interest taken by growers was very keen indeed.

The show conducted by the branch was a decided success; considering it was such a dry season the quality of the fruit was excellent. There were over 900 entries, and over £130 was taken, the expenses amounting to nearly £90. The best of the exhibits, together with photographs of the district, were sent to Challis House, Sydney, where they attracted much attention.

### Blacktown.

At a special meeting held on 10th April it was decided to postpone the second exhibition from May until September.

### Clovass.

The annual meeting was recently held when the election of the office-bearers took place, the following gentlemen being chosen :—Chairman, Mr. Garret Long; Vice-chairmen, Messrs. J. K. McDonald and R. A. Watterson; Treasurer, Mr. D. B. Lynch.

The election of secretary was postponed until the next meeting.

### Coraki.

The chief subject of discussion at the meeting held on 20th April was the proposed agricultural exhibit to be staged by members at the local show. The season, since the early part of the year, has been particularly favourable, and this, coupled with the enthusiasm of members, ensures a record exhibit, for the promotion of which an active organising committee has been at work.

### Cordeaux-Goondarin.

The monthly meeting of this branch was held on 29th April, and was attended by fifteen members. It was decided to establish an experimental plot for potatoes and maize, &c., on Mr. F. March's farm, and to ask the Department to allow Mr. Makin, Inspector of Agriculture, to visit the farm and select a suitable site so that the necessary preparatory cultivation may be carried out.

It was also decided to join the Kellyville branch in opposing the proposed orchard tax. Members failed to see why the Fruitgrowers' Association should be the only body allowed to collect the tax, when in various districts branches of the Bureau were doing very much better work than other organisations.

The erection of a hall in which to hold meetings was discussed, and the secretary was instructed to collect data with this end in view.

### Cotta Walla.

On 6th April Mr. J. E. O'Neill read an interesting paper on the use of a pure-bred sire in a dairy herd. He pointed out that a good paying herd could be built up from a foundation of ordinary cows by the consistent use of a pure-bred sire. With over 2,000,000 cows in Australia, whose average production was not half what it might be if proper methods of selection, breeding and management were followed by their owners, the subject was important. It was essential that the bull should be of a good producing strain, and the performances of his dam and of the family as far back as possible should be known. A good dam and a good grand-dam went a long way in establishing the quality of a bull, provided, of course, that his sire was also of a good strain.

### Dural.

The questions in the *Agricultural Gazette* for March were brought before the members at their meeting on 26th March, and a useful discussion ensued.

At the meeting held on 30th April the questions in the April *Gazette* were considered. Growers expressed the opinion that the ground should be ploughed as soon as possible after harvest operations. Several spoke of the good effects of frequent cultivation for retention of moisture.

Growers were quite unanimous that fumigation stood alone as a means of destruction of scale insects. In their opinion no other treatment was comparable to it. Whether this method was cheaper than spraying depended upon the material used in spraying. Several contended that it was as cheap to fumigate as to spray with oils. Even though spraying with some sprays might be cheaper, growers contended that by far the best value for the money spent was obtained by fumigation.

### Kellyville.

At the usual monthly meeting on 3rd May, a lecture was given by Mr. H. Reid on the blooming of deciduous trees in winter. He was accorded a hearty vote of thanks for a useful contribution.

The annual pruning demonstration was conducted by Mr. W. Le Gay Brereton, Assistant Fruit Expert, at Mrs. Agnew's orchard on 7th May. The attendance was good and valuable suggestions were offered.

### Lidcombe.

At a meeting on 19th April, Mr. L. Rumble delivered a lecture on vegetable growing. He advocated thorough work at the outset of any such enterprise, and good drainage. When manure was being dug in, it was a good plan first to dig in half, and a fortnight later to apply the balance ; this ensured more thorough distribution. Seedlings should not be raised in very rich soil, or they suffered a severe check when transplanted to poorer land. Useful information on the crops to sow at different times was also given.

In the discussion that ensued a good deal of further information was afforded by several members.

### March.

The usual monthly meeting was held on 28th April, when general business was disposed of.

### Matcham.

A meeting of this branch was held on 1st May, when eighteen members attended. After the disposal of general business, a discussion took place on co-operative buying of manures, seeds, &c.

### Middle Dural.

The members of this branch met on 20th April. It was decided that the manurial experiment work be carried out at Middle Dural, and that the orchard of Mr. C. W. Roughley be recommended as most suitable. It was further recommended and suggested that the Department carry out the experiment on different soils, and on all varieties of fruit (summer and citrus).

### Milbrulong.

A meeting was held on 18th March, when the secretary, Mr. J. M. Gollasch, read a paper on the hand-feeding of sheep, in which costs were considered in particular. The feeding of 1,000 sheep with different feeds was estimated as follows:—

| | £ | s. | d. |
|---|---|---|---|
| Silage ration ; 30 cwt., at 6d. per cwt.... ... ... ... | 0 | 15 | 0 |
| Wheat alone ; 8 bushels, at 4s. 6d. per bus. ... ... ... | 1 | 16 | 0 |
| Wheat and hay ration ; 4 bushels wheat, at 4s. 6d. per bus., and 15 cwt. hay, at 3s. per cwt. ... ... ... ... | 3 | 3 | 0 |
| Wheat and chaff ration ; 4 bushels wheat, at 4s. 6d. per bus., and 12 cwt. chaff, at 4s. per cwt. ... ... ... .. | 3 | 6 | 0 |

The figures were regarded as interesting, in that they showed that silage is by far the cheapest. The majority of members, however, thought the cost of producing silage (10s. per ton) was too low, and that the price of hay 3s. per cwt.), after keeping for, say, two years, and allowing for waste, was too high. One member related that in 1902, on one station, half the sheep fed on silage were lost.

Departmental Note.—The Chief Inspector of Agriculture remarks that on the experiment farms silage is usually conserved at a cost of rather less than 10s. per ton. It depends upon the nature of the season, but as a rule it is better to build up stocks of silage in years of heavy growth. For sheep farming, silage should be regarded as a reserve, and in most years should not be required at all. Of course, where crops are light the price would be increased. In feeding silage to sheep, allowance must be made for the labour entailed in doing so.

In all cases that have come under notice, the results from feeding silage have been excellent, sheep improving in condition, and no losses occurring. The losses on the station referred to may have been due to the sheep being put on the silage when in very weak condition and hungry. Danger attaches to any sudden change of feed under such conditions. During the present drought large numbers of sheep have been fed on silage with very satisfactory results.

At the meeting on 12th April, Mr. C. C. Crane, Organizing Inspector of the Agricultural Bureau, gave an address on co-operation and farm economics. Great interest was shown, and numerous questions were asked, and answered to the satisfaction of all present. It was suggested by the members that if a successful season resulted this year, a co-operative store should be built early in 1921. Meanwhile information is being gathered on the subject.

### Moss Vale.

A very enjoyable afternoon was spent on 9th April, when about twenty members of the Moss Vale Agricultural Bureau met Mr. E. Breakwell, Agrostologist of the Department of Agriculture, on the property of Mr. F. G. Hayes.

Mr. Breakwell pointed out the various grasses growing in the pastures and their respective values. It was found that there was quite a number of good native grasses, and that several desirable introduced grasses were also abundant. Attention was directed in a special way to red clover, which Mr. Breakwell had noticed lately to be seeding well wherever it was grown. This answered the one-time objection of farmers to this pasture

plant; apparently some insects were at work effecting fertilisation of clover, and the result seemed to be that a paddock of it would now be more permanent owing to the numerous young plants produced by the seed. It was also remarked that cocksfoot when mixed with clover produced a finer growth, and was less tussocky than when grown alone.

A paddock of rye grass on Mr. J. Wallis' property was also inspected. It had been sown in drills last year with an oat crop. The presence of weeds led Mr. Wallis to remark that drill sowing of rye grass was not as good as broadcast sowing.

In the evening, Mr. Breakwell addressed a number of local farmers on the growth of new grasses and fodder plants, urging a more hearty co-operation with the Department in the work that is being done.

### Mount Keira.

The office-bearers of the above branch for the ensuing year are as follows:—Chairman, Mr. J. Porter; Vice-chairmen, Messrs. C. Yates and Jas. Porter; Hon. Secretary and Treasurer, Mr. W. Yates; committee, Messrs. J. Hayes, G. Lewis, H. Brown, F. Walker, C. Buckle and A. C. Brown.

### Penrose-Kareela.

A valuable demonstration on apple packing was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 10th March.

The usual monthly meeting, which was attended by fifteen members, was held on 13th March, when matters of interest to local fruitgrowers were discussed.

At the meeting on 13th April, the winning of prizes at the recent Sydney Royal Show was discussed, among other things mentioned being the points in which the branch had been strong and those in which it was weak, as shown by the score card. All concerned were naturally very well pleased at having secured first prize, it being the first time the branch had entered an exhibit at the show.

Those members who had been mainly responsible were thanked for the success achieved. It was resolved to place an exhibit in one of the shops in the city on the occasion of the visit of the Prince of Wales.

### Quaker's Hill.

The usual monthly meeting of this branch was held on 1st May. As a result of the efforts of the branch, the Blacktown Shire Council is likely to take steps to proclaim stinkwort a noxious weed.

Discussion of several matters of local interest took up the evening.

### Springside.

At a meeting on 30th March, some very interesting reflections on the results of 1919 operations were read by Mr. T. C. Bowen.

Mr. Bowen remarked that the paddocks that were ploughed early for that season were those that had given the most satisfactory crops, those ploughed just before sowing giving very poor yields or resulting in failures, and this notwithstanding that the soil that was worked late seemed to be in the better condition. To get the full benefit of the work, the soil must be in a friable condition and moist enough to encourage the development of the bacteria which carry out their function in the top few inches of soil and which are thus enabled to prepare plant-food in the seed-bed. He pointed out the advantages of deep ploughing and producing a fine seed-bed with the clods on the surface, leaving the finer particles of soil beneath to be pressed down into a firm bed in which the roots could gain a good hold; a very fine or dusty surface should be avoided, as it became set and hard, and the seedlings could not break through. He considered that if the land was very dry at sowing time, it was safer to get the seed oats in, but planting must be shallow, for if sown deep the seed might be partly germinated and

never grow properly. With wheat he preferred not to sow until the ground was moist enough to germinate it at once, his experience being that if it was sown in a dry fine seed-bed and heavy rain came, a great deal of the young growth failed to come through, and the stand was a thin one. He found that crops sown on land in a fairly rough condition on the surface did much better at the start than those on a very fine surface, the air being able to circulate around and among the roots, and evaporation being prevented. In the spring, when the land could be worked, there was a surface that the roller and harrows could act on, killing all small weed seeds, and leaving a mulch of loose soil among the growing crops.

### St. John's Park.

At the meeting held on 16th April, Mr. M. J. Seccombe lectured on tillage, and demonstrated the presence of soil bacteria good and bad. Mr. Seccombe's lectures are becoming very popular with local residents.

### Stratford.

A meeting of thirteen members of this branch was held on 10th April, when, after the general business had been disposed of, a discussion took place on the dairy cow and successful dairying.

The secretary, Mr. Deards, in opening the subject, said three things were necessary, (1) a good type of cow (pure-bred or nearly so, and a Jersey for preference); (2) a good property on which ample supplies of winter fodder could be grown; and (3) the use of the Babcock tester and the scales, so that each animal's production should be known. The farmer who tried to dairy without a tester was labouring in the dark, and where small holdings existed only the best cows should be kept. Testing once a year was not sufficient, but by testing and weighing for six months reliable data could be obtained.

Mr. H. T. Perrin also advocated individual testing. They would not then be buying each other's culls.

Departmental Note.—The Dairy Expert remarks that much depends on the inherited productiveness of the cow herself and the feeding. Being pure-bred does not necessarily mean being of production strain. Many grade cows yield more at the bucket than their better-bred mates. The point is that the purer the breeding, the more prepotent the animal is. It is therefore essential to have inherited production in addition to long pedigree and type.

In grade herds the use of a pure-bred bull of this class would improve the average yield, and by continuing to breed on such lines, a high-producing herd could be built up. It is most advisable to settle on the breed that it is intended to develop, and adhere to it—not constantly to change the breed of bull used in the herd, as is sometimes done by dairy-farmers.

In the bulletins annually published by the Department, the production records of hundreds of pure-bred stock of each dairy breed are made available. These can be had by dairy-farmers or branches of the Agricultural Bureau on application, and act as a guide to intending purchasers of herd-book sires bred on production lines.

The general use of the grade bull cannot be too strongly condemned.

The exhibit staged by the branch at the Gloucester show was a great success, and aroused much interest. The exhibit contained twenty-six varieties of artificial grasses, six of fodder, twelve of maize, and sample bales of lucerne hay and Sudan grass hay. In addition, many varieties of carrots, tomatoes, beet, parsnips, cucumbers, grammas, potatoes, sweet potatoes, &c., were shown. Apples, pears, persimmons, walnuts, medlars, quinces, oranges, &c., were also displayed.

As a result of the above display, the local Press have suggested the formation of other branches in the district.

At a meeting on 1st May, the high cost of living and the means by which it could be met were discussed. It was urged that more vegetables should be grown, some members contending that in this respect farmers were very negligent. Mr. Germon, a baker, quoted the case of a customer who,

though having a large household, was among the smallest consumers of bread in his round. The reason was that the person in question grew unlimited supplies of vegetables.

The secretary urged that every farmer should grow vegetables. The Australian generally should be more self-supporting.

### Tallong.

A fruit-packing demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, under the auspices of this branch on 11th March, and was much appreciated.

The district was very successful with its apple display at the Sydney Royal Show, taking about forty individual prizes, and also second prize for the district.

The usual monthly meeting was held on 1st May, when several orchard matters came up for discussion. A complaint was voiced that the Railway Commissioners were making an excessive charge on empty return cases.

### Thyra-Bunaloo.

General business was transacted at the monthly meeting on 17th April, and arrangements were made for the business for subsequent meetings.

### Tingha.

On 29th January Mr. W. W. Froggatt, Government Entomologist, delivered a lecture under the auspices of this branch on economic entomology. The advances made by this science in recent years, and the ways in which it is of use to farmers were pointed out, and many insects that had become of economic importance were specially referred to and described.

On 11th February Mr. R. W. McDiarmid, Inspector of Agriculture in the north-west, gave a lecture on the growing of winter feed for stock. The requirements of animals and the ways in which various classes of plants met them were carefully described, and the recommendations of each discussed.

Mr. Cook, of the staff at Glen Innes Experiment Farm, on 6th February conducted a demonstration of summer thinning, which was much appreciated. Making use of a large number of trees, Mr. Cook was able to give much useful information, and the vote of thanks that was moved by Mr. Sullings at the close was warmly approved.

Mr. E. A. Parsons delivered an address on the growing of broom millet before members of the branch during April.

Mr. Parsons advocated deep ploughing early, sowing in October at 6 lb. per acre, in drills 2 feet 6 inches apart, 3 inches deep and seeds about 8 inches apart in the drill. This gave a fairly thick seeding, but when the weak plants were thinned out the stand should be satisfactory. Inter-cultivation to keep down weeds and prevent loss of moisture was recommended. About the first week in January the plants would be ready to have their heads bent over. If done too soon there was a big probability of the stem snapping, while if left too late the weight of grain would bend over and spoil the sample. He had found that the best guide was the bloom on the heads, and he always bent about half way between the first and second joints from the top. He recommended the selection in the paddock of the best heads for seed purposes.

At the monthly meeting, held on 1st May, a discussion took place on manures, and the following queries were raised:—

1. What are the relative merits of nitrate of soda and sulphate of ammonia as a top-dressing for such crops as cabbage, cauliflower, &c.?
2. Is muriate of potash at any time injurious? If so, when?
3. Is the too free use of wood ashes liable to render a potato crop scabby? What quantity is advisable, and how should it be applied?

## Toronto.

At a meeting on 6th April the secretary submitted a balance sheet in connection with the show, which indicated receipts to the amount of £17 19s. 8d., and a balance over the expenditure of £2 11s. 2d.

On 4th May Mr. Martin gave a valuable lecture on incubation (natural and artificial) of chickens, and was accorded a very appreciative vote of thanks.

## Wellington.

The feature of the March meeting of this branch was the reading of a valuable paper by Mr. E. G. Salter on wheat-breeding. Mr. Salter's interest in the subject is well known, and his paper reflected a wide acquaintance with many authorities. A summary of the paper follows :—

### Principles of Wheat Breeding.

It was little wonder that plant life got away with the soil water. If the roots, secondary roots and thousands of microscopic root hairs of a mature wheat plant, grown under favourable conditions, were placed end to end and measured they would total 600 yards ; it had been estimated that the root system of a mustard plant had a total length of over 2,000 feet, a clover plant over a mile, and a full-grown pumpkin vine over 15 miles. Plants lived and grew by a process of exchange with the air and soil. A simple example would illustrate the process (called osmosis) by which a plant benefited by the mineral matter in solution in the soil water. If a piece of parchment or bladder was covered over one end of a lamp chimney and this partly filled with strong brine and then placed in a vessel of water, the two liquids would be separated merely by the thin membrane. After a little time, each of the liquids would diffuse through the membrane and mix with the liquid on the other side. The movement would continue until the liquids on both sides of the dividing membrane were of the same composition.

This was the reason why plants in swamps or sloughs ceased to grow as soon as they became as alkaline as the soil surrounding them, also why a handful of salt would kill the grass on which it was placed, and why the immoderate use of strong manures did more harm than good—tending to balance the plant in strength and to check its growth.

With the taking in of soil-water through its roots came the plant's desire to grow, and automatically it started to divide its cells into two, by a process known as mitosis or cell division. All plants and animals grew in the same way. The nucleus (the heart or life of a cell) was composed of thread-like bodies of opposite attraction, which might be called plus and minus—or, using electrical terms, positive and negative. These living bodies (called chromosomes) becoming restless, the single cell became overcrowded, and the nucleus thereupon sent out two captains or leaders, which went to opposite ends of the cell—the plus captain to one end and the minus captain to the other. Being of opposite attraction, the plus (or positive) captain naturally attracted the minus or negative units, and the minus (or negative) captain the plus (or positive) units. Then ensued a microscopic tug of war. The captains at either end of the cell lined up their teams chosen from the chromosomes across the middle of the cell, and tugged away until half of each side was pulled over to the opposite side and the game was drawn, the nucleus having been pulled into two exactly equal parts. Each part then comprised a new nucleus at either end of the cell, and a wall formed between them. And so the process went on. The offspring of animals and plants was formed by the union of living material, split from the bodies of the parents, and man himself grew by the division of what he was in the beginning.

Speaking of selection, Mr. Salter remarked that whereas the control of the breeding of animals had been practised by man for over 2,000 years, the systematic mating of plants had only been practised for about two centuries. The discovery of sexuality in plants was only made in 1691, and nearly half a century elapsed before the structure of the flower was properly appreciated. Then, in later years, came the "school of genetics" on Mendel's principles of heredity. Mendel's discoveries were accepted in all lines of thought to-day. In reality, Mr Farrer discovered the laws of Mendel for himself.

Sometimes the complaint was heard that "seed has run out," and it was a question of importance how many farmers took care to see the seed did not run out. What possible advantage could one grower expect who changed his seed for another grower's who gave his crop as little attention as he himself? In reality he was most likely to benefit more from his own seed, as it had settled down to the conditions of its own soil. The reason for running out was that wheat was self-fertilised, good, bad, and indifferent plants all going to produce seed. "Just as there is a best plant in every field of wheat, there is

also a worst." The unattended crop settled down to the lowest mean and gradually "degenerated further." Farrer had remarked that "directly selection ceases, reversion commences." Other botanists had proved, on the other hand, that when a type of wheat had reached its best it was incapable of further improvement, except by crossing, which broke the type and introduced variation. Only in that way, in fact, was improvement on existing types possible. The great activity throughout the world in the improvement of wheat was the result of economic pressure.

"There is no reason why a good hard translucent grain of good quality gluten should not be grown and maintained by our local climate. As with all things of extra quality, we are approaching more tenderness. Mostly the high quality wheats have tender or weak straw, and straw needs just as much attention as the root system and head. It is no use putting a good head on a rotten foundation, any more than a good house on one; it must stand some weather even in normal times before the grain reaches the bag. If the head is on the ground at harvesting time it is as effectually lost to the bag as though it had never been sown. That is no good to the grower. Every part must be as good as we can make it, and should be fairly quick maturing to miss hot winds, and possibly stormy weather. So prepare your plant to meet the climate and conditions. Ours is naturally a dry atmosphere, drier as we proceed inland; but in stormy seasons as summer approaches, the steam arising from hot wet ground has a softening tendency on grain—unlike the effect of the rich, dark soil with a high altitude and the crisp air of Canada, which is also a dry air, but escapes the steam ascending from a hot ground. Their wheats are long maturing, which is conducive to free stooling and prolificacy. Our conditions demand early maturity, and earliness and prolificacy are diverse characters in combination; we must be prepared to forfeit some yield for the other advantage."

The method of crossing, and the lines on which improved wheats had been bred to improve the quality as well as to increase the yield, were indicated. The difficulty of crossing was greater with wheat than with most other plants, for the structure of the plant was against it, but it had been shown that crossing within the limits of the species resulted in a more vigorous offspring, while self-fertilisation tended to weaken the offspring. Dr. Cobb had said that "selection would be of more effect than cross-fertilisation, but improvements from selection are not permanent."

Mr. L. Jurd read an interesting paper at the monthly meeting on 20th April, his subject being the growing of dahlias. He considered that the spot selected should have an easterly aspect, and be protected from the sun after 2 p.m. The best soil was a well-worked heavy loam, but if it was very stiff horse manure and sand should be used to lighten it, while to sandy soil cow manure should be applied. The bulbs should be dug soon after being cut back by frost, and be stored in a dry place.

### Wentworthville.

The election of office-bearers at the annual meeting resulted thus:—Chairman, Mr. E. T. Baker; Vice-chairmen, Messrs. H. Beach and A. E. Parry; Treasurer, Mr. E. S. Taylour; Hon. Secretary, Mr. H. Druce; committee, Messrs. J. Coates, F. J. Madden, and C. Giddey.

### Wetherill Park.

A pruning demonstration was given by Mr. S. A. Hogg, Assistant Fruit Expert, on 5th May, under the auspices of the branch. There was a large attendance of farmers, who expressed themselves as well pleased with the demonstration and the information given about pruning, the peach tip moth, and other matters.

The chairman, when thanking Mr. Hogg, reminded the farmers of the good work done by the Agricultural Bureau, and appealed to those who were not members to join.

### Windsor.

A pruning demonstration was given, under the auspices of this branch, by Mr. W. le Gay Brereton, Assistant Fruit Expert, at Mr. J. Hall's orchard Wilberforce-road, on 30th April, and was much appreciated.

### Woonona.

At a meeting on 13th April, Mr. G. Fowler read a paper on the diseases of plant-life. He traced in some measure the history of knowledge of the subject, and pointed to the work of several notable men in this sphere. Applications of the subject were made in various ways, notably in pointing out the utility of bacteria in connection with soil fertility and manuring.

### Yarramalong.

At the meeting of the members of this branch held on 17th April, a discussion took place regarding the refusal of the Postmaster-General to extend the telephone line, the whole of the poles being guaranteed by the residents. It was decided to ask Mr. W. M. Fleming, M.L.A., to assist. It was also decided to ask for an extension to Ravensdale, as that place was in urgent need of telephone facilities.

## AGRICULTURAL SOCIETIES' SHOWS.

**Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.**

### 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Corowa P., A., and H. Society | J. D. Fraser | Aug. 17, 18 |
| Parkes P., A., and H. Association | G. W. Seaborn | ,, 18, 19 |
| Forbes P., A., and H. Association | E. A. Austen | ,, 23, 24 |
| Murrumbidgee P. and A. Association (Wagga) | A. F. D. White | ,, 24, 25, 26 |
| Lockhart A. and P. Society | E. D. Arnold | ,, 31, and Sept. 1 |
| Albury and Border P., A., and H. Society | A. G. Young | Sept. 7, 8, 9 |
| Young P. and A. Association | T. A. Tester | ,, 7, 8, 9 |
| Cowra P., A., and H. Association | E. P. Todhunter | ,, 14, 15 |
| Ganmain A. and P. Association | T. S. Henderson | ,, 14, 15 |
| Cootamundra A., P., H., and I. Association | N. Gardner | ,, 15, 16 |
| Northern A. Society (Singleton) | J. T. McMahon | ,, 15, 16, 17 |
| Narrandera P. and A. Association | W. H. Canton | ,, 21, 22 |
| Temora P., A., H., and I. Association | A. D. Ness | ,, 21, 22, 23 |
| Junee P., A., and I. Association | T. C. Humphreys | ,, 28, 29 |
| Holbrook P., A., and H. Society | J. S. Stewart | ,, 28, 29 |
| Deniliquin P. and A. Society | P. Fagan | ,, 29 |

### 1921.

| Society. | Secretary. | Date. |
|---|---|---|
| Kiama A. Society | G. A. Somerville | Jan. 25, 26 |
| Guyra P., A., and H. Association | P. N. Stevenson | Feb. 16, 17, 18 |
| Dapto A. and H. Society | F. James | ,, 18, 19 |
| Newcastle A., H., and I. Association | E. J. Dann | ,, 24, 25, 26 |
| Glen Innes P. and A. Society | Geo. A. Priest | March 8, 9, 10 |
| Taralga A., P., and H. Association | J. J. Kearney | ,, 10, 11 |
| Upper Hunter P. and A. Association | R. C. Sawkins | ,, 16, 17 |
| Royal Agricultural Society of N.S.W. | H. M. Somer | ,, 21 to 30 |

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THE

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OF

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# CONTENTS.

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# Natural Crossing in Wheat.

J. T. PRIDHAM, Plant Breeder.

DARWIN, in his "Variation of Animals and Plants," says "the flowering structures of all plants are so arranged, that we may conclude . . that the capacity for occasionally intercrossing is present or has been formerly present with all plants." On the same subject, De Vries remarks: "It was assumed that crosses were of common occurrence only with rye, the other grains fertilising themselves; but experience has shown that this is only an average rule, and that everywhere, in the field, accidental crosses may occur." O. F. Cook has pointed out that "natural crossing is common among cultivated wheats in Palestine. In addition to a full series of different forms of heads . . there is an equally complete range in colour."

The Howards, in India, state that "231 cases were proved by us at Lyallpur, and of these no less than 226 took place in 1907. In the dry climate of the Chenab colony, wheat is grown entirely by canal irrigation and is usually watered at least twice after sowing, the last watering taking place after the plants are in ear. Often before this last watering, the soil moisture is so small that the plants wilt during the hottest part of the day, the glumes open and the stigmas are exposed. Natural crossing is thus easy and it is not surprising that it is so frequent." H. Pye, of Victoria, in 1914 wrote: "I am beginning to find more natural crosses than ever . . I think the anthers are deficient in pollen or shrivel, and the ear opens for wind infection."

On the other hand, Garton, of England, considered from his emasculating experiments that natural crossing did not exist. Biffen, of Cambridge, after growing over 200 varieties, says: "I have never met with a case."

Although natural crosses are very rare in the damp climate of England, it is otherwise in the drier and more sunny latitudes. Koernicke, at Popplesdorf, records several cases and says that *Triticum compactum* is more disposed than any other form to cross in the field. Hansen, at Lyngby, and Nilsson, at Svalöf, find that in warm, good weather forms that are generally considered self-fertilised cross with each other, and that crossing between common wheats and spelts occurs under such circumstances. Mr. Pye also finds these forms most prone to the phenomenon.

Rimpau says, "During thirty-five years, thirty varieties of wheat were grown near one another, and only twelve cases of cross-fertilisation were noted; fifty kinds of barley were cultivated in close proximity for twenty-five years, but only nineteen cases occurred."

H. K. Hays, of Minnesota, in giving his recent experience says:—"Results show that in 1917 there was considerable natural crossing—quite 2 to 3 per cent. Crossbreds made many years ago, and now comparatively

pure, were seen to show variations. The individuals rogued out apparently bred true, but when sown again there were a few off-type plants, many of which were clearly $F_1$ crosses. This is probably why the belief has arisen

**Results of Natural crossing in Hard Federation.**

ach ear is from a sparate plant or strain. Variations are evident in density, tip-awn, colour and shape.

that crossbreds (hybrids) frequently revert. Variations found in farmers' crops in the main breed true. In the light of the data given, these cases are more likely to be natural crossbreds than mutations."

Coming nearer home, we find that the variety Marshall's No. 3 originated as a natural cross in a crop of Ward's Prolific. Seed sown from the original plant yielded $\frac{1}{3}$ white straw and $\frac{2}{3}$ purple straw plants. Mr. R. Marshall gave me its history when visiting him in 1915. Steinwedel, picked out of a crop by a farmer of that name in South Australia, probably had a similar origin. In Western Australia, Mr. W. C. Grasby has recently found Wilfred wheat, which has been uniform for some years, breaking up into several types. The late Mr. W. Farrer, of this State, found a number of cases among Indian sorts and some few in other varieties.

**Typical Brown Awnless Ears of Hard Federation.**

During the last ten years we have seen cases in seven Indian varieties. Two of these came from Howard, of the Indian Department of Agriculture, who bred and fixed them most carefully on Mendelian lines. Other varieties in which we have found what appear to be natural crosses, are:—Australian Talavera, Thew, Marshall's No. 3, Grosse's Prolific, Firbank, Comeback, Bunyip, John Brown, Sunset, Droophead, Yandilla King, Fretes, Ecksteen, Currawa, Warren, Jumbuck, Zealand, Commonwealth, Huguenot, Federation, and Hard Federation.

The character of the variations may be illustrated by a few examples. In Thew, the progeny showed more awn at the tip in some plants than in others, and the plot showed more vigour than that of the mother variety. In the case of Bunyip, a tip-awned wheat, a much paler foliage colour was seen, and the ears were fully clothed with rather short dark awns. The milling examination of three variants from Bunyip showed flour strengths of 44, 46, and 49 respectively. Huguenot at Wagga Experiment Farm yielded a plant

twelve inches higher than the mother crop, and its progeny next year varied greatly in type: none, however, was as tall as the original. From Zealand, which has tapering white ears, a brown-eared plant was taken, the progeny of which yielded some plants with awns and others awnless. Federation has thrown variations in the shape and colour of the ear, the presence or absence of awn, and the appearance of the grain.

It is often possible to make a guess at the parentage which is not likely to be wide of the mark. For instance, we have a natural cross from Hard Federation which produced twenty-six brown-eared, eighty pale brown and twenty-nine white-eared plants. They were all tip-awned, and the grain varied in plumpness, density, and translucency. The brown-eared progeny resembled Hard Federation and the white-eared Marshall's No. 3. A variant from a fixed crossbred with large soft grain showed grain of a rather smaller and more rounded type, like Hard Federation. A similar character was seen in an individual taken from Field Marshall, which has soft large grain.

It is our custom to sow varieties under test in alternate rows with Hard Federation, repeating the series three times. A buffer is thus provided on either side of each variety, giving as nearly as possible uniform conditions for its development. By using a variety which has proved itself a suitable and profitable one for the district, we may reasonably expect that as a large proportion of any natural crosses that may occur will have this wheat for one parent, useful varieties may be produced.

It will be evident from the foregoing that care must be taken in the growing of seed wheat. By raising pedigree seed in nursery rows, starting with individual plants sown one grain at a time by hand, one is able to detect any differences that may occur in the plants. If this process is kept up, only mixing the produce of single plants when sowing larger bulks, the farmer need have no fear of a variety becoming mixed or deteriorating from natural crossing; but, as soon as a wheat is grown for a few seasons without regard to individual selection, there will be variations in the crop. Mechanical admixture from machines, bags, &c., probably accounts largely for the impure state of the seed wheat on many farms, but we are not infrequently confronted with a sample of wheat to be named, which we cannot identify with any of our cultivated varieties. Often these are cases of natural cross-fertilisation.

We have not studied the occurrence of natural crossing with regard to climatic conditions, but Mr. C. R. Ball, the agronomist in charge of western wheat investigations in the United States of America, writes, in January, 1916:—

This phenomenon occurs rather commonly in some sections of the United States. This country may be separated roughly into four divisions, on a basis of climate.

1. The humid division, extending from the Atlantic coast to an irregular line some 300 or 400 miles west of the Mississippi . . . . This division grows soft or semi-hard red winter wheats almost exclusively, with the exception of the extreme north-west corner, where, in Minnesota and part of Iowa, hard red spring wheats predominate.

2. The Great Plains area, lying between the humid division and the Rocky Mountains and extending northward into Alberta and Saskatchewan, in Canada. This division grows hard red winter wheats of the Turkey or Crimean group in its central portions, and hard spring wheats (including durums), in the north.

3. The Rocky Mountain region where, in more or less elevated irregular valleys, soft or semi-hard spring wheat is grown to a limited extent.

4. The great semi-arid basins and valleys between the Rocky Mountains and the Pacific. These grow wheat of diverse varieties. Those predominating are soft, mostly white, winter and spring wheats, some of them being club varieties. The hard red winter wheats have been introduced in recent years, and are now extensively grown in Oregon and Washington, and, to a considerable extent, in Idaho and Utah.

In the first division, characterised by a 30-45 inch rainfall or more, natural wheat hybrids occur very rarely, or not at all. In the second, or Great Plains area, characterised by a fairly dry and windy climate, with considerable summer rain, but with long dry spells and often severe drought, natural hybrids occur rather frequently, in the breeding plots as well as in farmers' fields. In the irrigated valleys of the third division I have very little information as to the occurrence of natural hybrids. In the basins and great valleys of the fourth or western division, characterised by low rainfall (none of which falls in the summer) and by comparatively low wind velocities, natural crossing of wheat varieties is extremely common. Hybrids occur frequently in the nursery and testing plots, and may be found practically in every commercial field with the exception of the recently introduced hard red winter wheats.

Mr. Ball's remarks have been quoted extensively, as he indicates by the way the class of grain being now grown for the world's markets. The fourth division he speaks of corresponds a good deal to our wheat belt, except that we have a good deal more wind, which perhaps reduces the extent of natural crossing that would otherwise occur. Like the farmers in that area, we grow a considerable number of varieties, but we may note that the harder grain sorts are winning favour in America.

## Is *Stypandra glauca* R. Br., a Poison Plant?

As far back as the year 1894 (see a note in this *Gazette* for March of that year, page 142) the above plant was sent as a suspect from the South Coast. It has no common name so far as I know, grows up 2 or 3 feet high, and has pretty blue flowers and distichous leaves 2 to 4 inches long. It is common in the neighbourhood of Sydney, the Blue Mountains, and many other parts of the State, and during the the last quarter of a century, has increasingly been reported as a suspected plant, but I have never been able to get any definite information concerning it.

A few days ago a grazier in the Molong district wrote to me as follows:—"I send you a kind of nettle and also a plant with a blue-bell flower. Some people call it the 'mountain bluebell.' For a number of years I have had a number of sheep and cattle poisoned with some kind of weed in a certain paddock. After investigation I feel sure that one of the above plants is the cause of the trouble. The stock sicken and die in a day or so."

I think that the nettle can be acquitted, but as to the bluebell there is very little to go upon, and I have advised communication with the Chief Inspector of Stock.

I may say that in south-western Australia no one seems to have any doubt as to the poisonous character of this plant. It is said to produce blind disease in sheep, and one of its names is "Candyup poison" because it is common in the district of that name, a little east of King George's Sound.

I think it is high time that pastoralists and others should make accurate observations in regard to this particular plant, and keep in touch with the Chief Inspector of Stock on the matter.—J. H. Maiden.

## Sulphur as a Fertiliser for Wheat.

In view of reports from experiment stations in other parts of the world, it was decided in 1915 to conduct a series of tests with sulphur as a fertiliser for wheat at Cowra Experiment Farm. The results have been negative, slight increases having been obtained in certain cases, but at such a cost as to make the treatment unprofitable. The plots were $\frac{1}{4}$ acre in area.

Results of trials for four years 1915 to 1919 (1916 a failure).

| Treatment. | Yield per acre. | Increase. | Value of Increase.* | Cost of Increase.† | Net gain. | Net loss. |
|---|---|---|---|---|---|---|
| | bus. lb. | bus. lb. | s. d. | s. d. | s. d. | s. d. |
| Superphosphate, 56 lb. ... ... | 18 42 | 1 6 | 5 6 | 2 6 | 3 0 | ...... |
| Sulphur, 28 lb. ... ... ... | 18 18 | 0 42 | 3 6 | 9 6 | ...... | 6 0 |
| Superphosphate, 56 lb., and sulphur, 28 lb. | 18 30 | 0 54 | 4 6 | 12 0 | ...... | 7 6 |
| Sulphur, 56 lb. ... ... ... | 17 42 | 0 6 | 0 6 | 19 0 | ...... | 18 6 |
| Superphosphate, 56 lb., and sulphur, 56 lb. | 18 6 | 0 30 | 2 6 | 21 6 | ...... | 19 0 |
| Untreated ... ... ... ... | 17 26 | ...... | ...... | ...... | ...... | ...... |

* Wheat valued at 5s. per bushel. † Superphosphate valued at 5s. per cwt., and sulphur at 38s. per cwt.

## Horse Radish as a Crop.

Horse radish requires a deep well-drained soil, and will not grow well on shallow or wet soils. It is propagated by cuttings from the smaller roots, straight pieces 5 or 6 inches long and $\frac{1}{4}$ inch or less in thickness being most desirable. Propagation from old divided crowns is not advisable, as they give crooked and branched roots that are undesirable for marketing. These root cuttings should be set upright in the soil, 12 to 18 inches apart, in rows 3 feet apart, and covered with about 3 inches of soil. Sowing should take place in March or April, and the crop should be treated as an annual, being ploughed or dug the following year in winter, and fresh roots transplanted to another place. If allowed to grow as perennials in the same spot, the plants become troublesome as weeds. Long straight roots should be trimmed and washed preparatory to marketing. It is difficult to obtain a good market.—A. H. E. McDonald, Chief Inspector of Agriculture.

## How to Mix Manures.

In making mixtures of chemical fertilisers, the ingredients should be thoroughly incorporated in small quantities. Lumpy manures, before mixing, and the mixture when made, should be passed through a sieve, and the remaining lumps carefully broken up. If the mixture is not to be sown immediately, it should preferably not be bagged at once, owing to its tendency to set immediately after mixing, but should be allowed to lie in a heap for a few days, after which it may be broken up, turned through a riddle or harp, and then bagged. After this treatment the mixture should not readily set or become lumpy, and may be kept for weeks. The most important point is always to mix systematically in small quantities.—*Journal of the Ministry of Agriculture*, London.

# Sugar-beet growing in Victoria.*

R. G. DOWNING, B.Sc. (Agr.), Acting Senior Experimentalist.

MAFFRA, the centre of the sugar-beet industry in Australia, is situated in East Gippsland, 131 miles from Melbourne. The surrounding country is practically flat, with occasional ridges, and mainly consists of a free-working alluvial of basaltic derivation. The soil varies in fertility, but on the second-class alluvial land good beet crops are grown. The ridges are of gravel formation, only suitable for grazing, and the average price of land is £40 per acre. The yearly rainfall varies very much, the average being about 22 inches, of which, as a rule, not less than 10 inches falls between 1st October and 31st March. The district is not regarded as an ideal one for growing sugar-beet on account of the comparatively low and erratic rainfall. There is not in this State a district corresponding to it in soil and climate, but there are certain areas on the coast resembling it, in which better crops of beets would probably be grown than at Maffra.

This season about 1,000 acres were sown with beet in the Maffra district. This area represents the combined efforts of between forty and fifty growers, and the greater portion of it is rented at from £2 to £3 per acre. None of this area is irrigated, although it has been proved that irrigation at Maffra results in very heavy yields.

The difficulty last year, on account of the great demand for grass country by stockowners of less fortunate districts and because of the high prices obtaining for maize and other farm products, was for the beet growers to rent sufficient land to put their usual area under crop, while farmers who own land have also been tempted to take advantage of the promising market for maize and potatoes. This resulted in a slightly decreased area last year, and the outlook for next year is scarcely promising.

The factory would be run much more economically if the produce of over 2,000 instead of 1,000 acres were treated. This will always be the trouble under the present system. A suggestion by the Beet Growers' Association is that the Government should resume 1,000 acres in the district for the purpose of letting it in small areas for growing beet, with the alternative of purchase by the growers at a later date.

An average yield of beet at Maffra is 12 tons per acre. The roots were paid for this season at the rate of 35s. per ton, and the probability is that the price for next year's crop will be higher. Allowing £12 for all costs until the beets are delivered at the factory, this leaves a profit of £9 per acre. There are doubtless many crops that at present give higher returns compared with the capital value of the land, but the contention of Maffra growers is that there is not a crop which, over a period of years, gives such a high average return.

* Extracted from a report on a visit to the sugar-beet districts of Victoria.

The standard of farming required in beet-growing is a high one, and much hired labour is necessary. These are two considerations which should deter the average farmer in our coastal districts from attempting the crop on a large scale. As a rule in our State the more fertile the soil the more careless in their methods are those farming it, while owing to the present uncertainty of the labour factor, the farmer naturally prefers crops showing a smaller margin of profit with less risk in this respect.

Difficulties such as the foregoing will, as farm practice in these districts improves and labour conditions stabilise, gradually disappear. In the initial stages in Victoria local diffidence—in fact, prejudice—had to be overcome, but the industry may now be said to be firmly established.

### Summary of the Facts.

The principal points which struck me during my visit may be summarised thus:—

1. From 1,000 acres (of an average value of £40 per acre) this season sugar is being produced worth £60,000 by the time it reaches the consumer.

2. Of this sum growers (about fifty in number) receive £21,000, of which £12,000 covers all costs of production.

3. About 110 men employed in the field for about four months of the year receive about £9,000 in wages during the time.

4. In the factory, 140 men, employed for upwards of three months, receive about £11,000 in wages.

5. That is to say, by the cultivation of 1,000 acres more than £30,000 is annually distributed in the district. The results are seen in the increased prosperity of the locality since beet-growing has come into favour.

6. Beet-growing may be profitably combined with the operations of a mixed farm. The tops and leached pulp, particularly the former, are splendid feed for stock, and the most successful farmers in the Maffra district are those who combine beet-growing with dairying.

7. The thorough tillage given the beet crop results in a splendid condition of the soil for the following cereal crop. For example, a 20-acre paddock considered "crop sick" was put under beet for two seasons—the crops averaged about 12 tons of beet. In the following year the paddock was sown, partly with oats and partly with barley. The resulting crops averaged per acre 3 tons of oaten hay and 60 bushels of barley.

8. By the practice of feeding the tops and leached pulp on the farm the soil fertility is maintained, since the sugar removed contains only carbon, hydrogen, and oxygen—all of which are obtained by the plant from the air.

9. Beet, above all, demands good soil for successful cultivation, but, as the resu ts at Maffra with a low rainfall show, when once established in the spring it withstands "dry spells" and quickly responds to rain or irrigation. Once the crop is ready to lift (about March or April), the grower is not rushed for time, but has a month in which to suit his convenience with the operation. Wet weather or labour difficulties are, therefore, not so serious at this time as with most other crops.

### Recommendations of the Crop for New South Wales.

The desirability of establishing the crop in New South Wales is obvious, and small trials should certainly be made, with the idea of finding suitable districts, and accustoming farmers to the crop. The question of erecting a factory, since it would involve an outlay of at least £150,000, may well be left to the future. Since, however, the factory must be within reasonable distance of good supplies of coal, limestone, and water, a district must fulfil these conditions to render it worth while considering as a possible beet-growing area. The working expenses of the Maffra factory are considerably increased owing to the fact that their coal comes from Newcastle to Melbourne, and then to Maffra, while their limestone is sent a distance of about 200 miles.

Several growers were very interested to hear that the New South Wales Government was interesting itself in beet-growing, and expressed themselves as anxious to take up land in some district where it had been shown that the crop could be grown profitably and where a factory had been established.

A point which struck me was the probable difficulty of working a factory for the first year owing to the scarcity of skilled labour. Mr. Williams (Factory Manager) informed me that the Honolulu Iron Works—a company which specialises in the setting up of sugar factories—undertakes to run for the first year any factory which they erect. Other companies probably do the same.

However, not a great deal of skill is required in running the various portions of the plant, and this year at the Maffra factory two-thirds of the hands are newly employed.

## WHITENING FOR ROOFS.

THE following mixture is largely used by the Department with good results for whitening roofs:—

Slake half a bushel of freshly burnt stone lime with hot water, covering the mass over with a few layers of thick bags (such as maize bags) while it is slaking, and leave it so covered for about half-an-hour. Add to this firstly, 1 lb. of soft soap previously dissolved in hot water, and then 1 lb. of alum, also dissolved in hot water. Stir well together until about the thickness of cream. Cover up tightly as before and leave standing for about three days, when it will be found to be in putty form.

To prepare for use, thin down with hot water to the consistency of good paint, and strain through a fine sieve. Apply to the roof in cool weather with a two-knot brush two coats, allowing about six days between the two. When desired, colouring matter may be added.

The above makes a good cheap paint for roofs and tanks, and also for brick, cement, stone, or even rough wood work, and will last for three to four years.—A. BROOKS, Works Overseer.

## Fattening Store Cattle on Fertilised Pasture.

Experiments were recently conducted by the Irish Department of Agriculture with the object of determining the effect upon the live weight of cattle of dressing pasture with basic slag. A 10-acre field was divided into two equal parts, and having first been grazed over by the same number of cattle for a period to ensure equality, one of the plots was dressed with 2 tons of 30 per cent. basic slag at a total cost of £9 5s. Dairy cows were kept on the plots for the following two seasons, and four 1½-year-old store crossbred Shorthorn bullocks of average type were then put on each plot. The experiment under notice was, therefore, more to determine the residual effect of the basic slag on store cattle.

One lot of bullocks was placed on each plot, and at the close of six weeks the animals were weighed and transferred to the other plot, this being done four times until twenty-four weeks had been covered. As it is essential in such an experiment that the pasture be kept equally eaten down, other bullocks were used to do this as required.

The results showed that the plot treated with basic slag gave 302 days more grazing than the untreated, and that the bullocks grazed thereon made a total increase in live weight of 19 cwt., while those on the untreated plot made only 10 cwt.

## To Infect Lucerne Seed with Nodule Organisms.

The best way of infecting lucerne seed with nodule organisms is by the use of soil from an old lucerne patch where the plant has grown well. The soil should be in a dry dusty state, and the seed should be mixed with it thoroughly so that there is no doubt about infection taking place. The seed should then be sown with a drill or broadcasted in the ordinary way. The soil should be dried in the shade and the sowing of the seed carried out during the afternoon. Sunlight will kill the organisms—hence these precautions.

It is sometimes advisable to use very thin glue, passing the seed through it and then dusting with soil obtained from the old lucerne patch. The glue should be very thin and the seed only lightly coated.

The Department supplies artificial cultures, but culturing weakens the organisms, and a natural infection from the soil is always preferable.—C. O. Hamblin, Assistant Biologist.

## How to Store Seed Potatoes.

Potatoes will keep for seed in bags, but other methods of storing are much to be preferred. The best method is to place the seed in shallow boxes, rose end up, and store in a shed—preferably open on one side to allow of the entrance of plenty of light. This treatment will cause a greening of the tubers and the development of short sturdy green shoots, will reduce loss to a minimum, and will give the crop an early start. Failing "boxing," the seed should be spread out on shelves or on the floor.—A. H. E. McDonald, Chief Inspector of Agriculture.

# Wheat Experiments for Hay.

## YANCO EXPERIMENT FARM, 1919.

E. FURBY, Experimentalist.

EXPERIMENTS carried out with wheat at this farm during 1919 were confined to early, mid-season, and late plantings of several varieties, the following coming under observation:—Zealand, Marshall's No. 3, Yandilla King; Cleveland, Improved Steinwedel; Thew and Firbank.

Zealand, being considered the most suitable variety for hay under irrigation, was again used as the check variety for each of the three plantings. The area of each plot sown was fairly large, being one-fifth of an acre, which area should tend to make the comparative weights much more accurate, especially as the soil on this farm is most variable in texture and fertility.

As there was a slight hitch in planting each section to date, owing to the interference of rain while the ground was being prepared for sowing, the three plantings should be regarded respectively as mid-season, late, and very late. Otherwise the only alteration of the previous year's plan was the substitution of Thew for Florence, and of Improved Steinwedel for Steinwedel, the replaced varieties being unprocurable.

### The Preparation of the Soil.

The general uniformity of growth of the crop in each section was largely due to the fact that a heavy crop of Grey field peas had been ploughed in during the spring of 1918, which increased the nitrogen content evenly throughout the paddock. A further deep ploughing was given after a fallow of four months, the ground afterwards being worked down to a finer tilth with a disc-cultivator to facilitate efficient grading. The latter operation was carried out three times to ensure an even and thorough distribution of water when irrigating. Although grading entails a large amount of work, this is fully compensated for by the ease with which the ground irrigates (less labour consequently being required), and also by a more uniform growth of crop. Check banks to divide each variety were built during March, approximately one-third of a chain apart. This was rather close, no doubt, but here, too, with check banks at least half a chain apart, on ground which is inclined to be uneven in its levels, the labour of construction is fully justified, again for the reason that thorough irrigation is the outcome.

In the case of the early and mid-season plantings, the usual practice on this farm of irrigating the ground and cultivating immediately prior to sowing was adopted. This was not possible in the case of the late planting, as no irrigation water was available at the time. The practice of sowing seed in a dry seed-bed and afterwards irrigating to germinate the seed is too often attended with disaster, more particularly on the heavier classes of soil, and cannot be too strongly condemned.

### The Season.

The experiments were conducted under more adverse weather conditions than have been experienced for some years past—the driest, in fact, in the history of the Riverina. No doubt, drought is met by the artificial application of water, but the absence of the normal humidity in the atmosphere is not entirely overcome by watering as the crop requires it. The winter was also exceptionally cold, heavy registrations of frost being frequently recorded, while strong winds blew persistently throughout the season.

The whole crop was planted and brought to fruition on practically irrigation water alone. Although the rainfall was fairly evenly distributed over the growing months, it never fell in sufficiently large quantities at any one time to be of real benefit. The rainfall from the time of planting the first crop till the harvesting of the last was as follows:—

| | | | |
|---|---|---|---|
| April ... | 31 points. | August ... | 53 points. |
| May ... | 139 ,, | September... | 67 ,, |
| June ... | 30 ,, | October ... | 90 ,, |
| July ... | 35 ,, | November ... | 14 ,, |
| Total ... | | ... | 459 ,, |

The falls ranged from 2 points to 45 points, and were recorded on twenty-five wet days. This rainfall was not sufficient to maintain the crop throughout the whole winter, and it had to be supplemented by artificial watering when water was made available in the latter part of July.

Ideal hay-making weather was experienced for harvesting.

### The Early-sown Plots.

This planting was made on 29th April, the delay here being due to light falls of rain preventing the ground from drying sufficiently to plant in the middle of April. The soil at planting was in excellent condition, and with the aid of light falls of rain after planting, germination of all varieties was all that could be desired. Being sown early and having germinated well, these plots received the full benefit of 139 points of rain in May, and consequently a very vigorous early growth was the result. It was on these plots that the tallest and most prolific growth was made, and the greatest weights of hay secured. This is invariably the case with early planting. These plots were irrigated twice—on 19th August and 23rd September. The results were as follows:—

| Plot No. | Variety. | Per cent. Yield. | Acre Yield. | | | | Date of Harvesting. |
|---|---|---|---|---|---|---|---|
| | | | t. | c. | q. | lb. | |
| 1 | Zealand ... ... ... *Check* | 100 | 3 | 19 | 0 | 8 | 26 October, 1919. |
| 2 | Marshall's No. 3 ... ... | 98·6 | 3 | 3 | 3 | 0 | 23 ,, 1919. |
| 3 | Yandilla King ... ... ... | 108·1 | 3 | 19 | 2 | 1 | 23 ,, 1919. |
| 4 | Cleveland ... ... ... | 91·5 | 3 | 6 | 0 | 18 | 23 ,, 1919. |
| 5 | Zealand ... ... ... *Check* | 100 | 3 | 11 | 0 | 3 | 26 ,, 1919. |
| 6 | Improved Steinwedel ... ... | 104·5 | 3 | 14 | 1 | 9 | 8 ,, 1919. |
| 7 | Thew ... ... ... ... | 96· | 3 | 8 | 2 | 13 | 8 ,, 1919. |
| 8 | Firbank ... ... ... ... | 87·6 | 3 | 2 | 1 | 13 | 8 ,, 1919. |
| 9 | Zealand ... ... ... *Check* | 100 | 3 | 12 | 2 | 5 | 26 ,, 1919. |

### The Mid-season Plots.

Delay was also incurred in planting these plots, rain falling after the ground had been irrigated; this carried the sowing date forward to 10th June, which must be classed as late, as it is not usual to plant any later than this. Germination of all varieties in this case was considerably retarded owing to the ground being much colder, but it was nevertheless fair, as the ground was in fairly good condition. The later growth was slow, but the approach of warmer weather in the spring, together with irrigations on 19th August and 23rd September, forced it a little. The crop generally did not compare at all favourably with the earlier sown plots, only medium yields being obtained. These were as follows:—

| Plot No. | Variety. | Per cent. Yield. | Acre Yield. | | | | Date of Harvesting. |
|---|---|---|---|---|---|---|---|
| | | | t. | c. | q. | lb. | |
| 1 | Zealand .. ... *Check* | 100 | 2 | 3 | 3 | 5 | 3 November, 1919. |
| 2 | Marshall's No. 3 ... ... | 95·6 | 2 | 0 | 2 | 9 | 3 ,, 1919. |
| 3 | Yandilla King ... ... | 90·5 | 1 | 17 | 0 | 21 | 3 ,, 1919. |
| 4 | Cleveland ... ... ... | 110·2 | 2 | 3 | 3 | 0 | 3 ,, 1919. |
| 5 | Zealand ... ... *Check* | 100 | 1 | 18 | 1 | 6 | 3 ,, 1919. |
| 6 | Improved Steinwedel ... | 94·5 | 1 | 15 | 3 | 1 | 28 October, 1919. |
| 7 | Thew ... ... ... ... | 105·3 | 1 | 19 | 1 | 4 | 28 ,, 1919. |
| 8 | Firbank ... ... .. | 62·3 | 1 | 2 | 3 | 22 | 28 ,, 1919. |
| 9 | Zealand ... ... *Check* | 100 | 11 | 6 | 1 | 5 | 3 November, 1919. |

### The Late-sown Plots.

This planting was made on 30th June under unfavourable conditions. It was necessary to irrigate the ground at the same time as for the mid-season sowing, and to keep it cultivated, with the result that it had dried up considerably by the time the sowing was made, leaving an undesirable seed-bed. The ground was exceedingly cold then, and this, with the absence of the necessary moisture, was the cause of a very poor germination in all varieties, and an extremely weak growth for the first ten weeks. Three irrigations were given this crop, the first on 19th August when the crop was only about 6 inches high, the second on 23rd September, and the third on 29th October, just prior to the flowering stage in the earliest varieties. The two last irrigations accelerated the growth of the crop, finally giving greater yields than were at first expected. After the first irrigation it was found necessary to harrow the crop in the endeavour to break up the hard surface of the ground and so stimulate growth. Although the lack of rain at the right time was largely the cause of the poor yields obtained,

planting so late in the season has never yet been attended with any degree of success. The yields obtained from this planting were as follows :—

| Plot No. | Variety. | Per cent. Yield. | Acre Yield. | | | | Date of Harvesting. |
|---|---|---|---|---|---|---|---|
| | | | t. | c. | q. | lb. | |
| 1 | Zealand ... ... *Check* | 100 | 1 | 8 | 0 | 19 | 17 November, 1919. |
| 2 | Marshall's No. 3 ... ... | 88·5 | 1 | 4 | 2 | 1 | 17 ,, 1919. |
| 3 | Yandilla King ... ... | 110·0 | 1 | 10 | 0 | 20 | 17 ,, 1919. |
| 4 | Cleveland ... ... ... | 110·0 | 1 | 9 | 1 | 19 | 17 ,, 1919. |
| 5 | Zealand ... ... *Check* | 100 | 1 | 6 | 1 | 0 | 17 ,, 1919. |
| 6 | Improved Steinwedel ... | 94·5 | 1 | 4 | 0 | 27 | 17 ,, 1919. |
| 7 | Thew ... ... ... ... | 117·1 | 1 | 9 | 2 | 1 | 6 ,, 1919. |
| 8 | Firbank ... .. .. | 79·0 | 0 | 19 | 1 | 9 | 6 ,, 1919. |
| 9 | Zealand ... ... *Check* | 100 | 1 | 3 | 3 | 10 | 17 ,, 1919. |

In view of the poor results obtained from late sowing as compared with the profitable yields invariably obtained by planting early, it has been decided by the Experiments Supervision Committee, upon the recommendation of the Manager of Yanco Experiment Farm, that late planting shall in future be eliminated.

## Notes on the Varieties.

*Zealand* in this trial has not upheld its reputation of being the best and heaviest hay wheat for this farm, probably on account of the unfavourable growing conditions. In each sowing it was by far the most prolific wheat, particularly in the early and mid-season plots, but when cured it weighed much lighter than was expected. It is the second latest maturing variety in the trial; when young it is vigorous growing, dark-green in colour, and stools moderately. At maturity it was 5 feet 6 inches high.

*Marshall's No.* 3 has not this year come up to previous records as regards percentage yield. It is late maturing, and gave best results when sown early, though not equal to Zealand. For the first month after germinating this variety has a peculiar spreading habit, but finally it grows upright with drooping foliage. It is a moderate stooler, with fairly fine straw, and makes into a good class of hay.

*Yandilla King* is very similar to Marshall's No. 3, though the foliage is not quite as broad. It is also late maturing, and has a procumbent habit when young. It grew to a height of 5 feet in the early plots, and generally did very well this season.

*Cleveland* is the latest maturing variety under trial. The crop on the late plots was very thin and sparse, but on the early and mid-season plots a fairly vigorous growth was made, reaching 5 feet in the early plot. This variety does not stool very heavily, nor carry much foliage.

*Improved Steinwedel* matures at about the same time as Firbank or Thew when sown early, but is later when sown late in the season. It grew to a height of 4 feet 6 inches in the early plots, stooled very well, and produced an abundance of dark-green foliage from the base of the straw to the top. The straw is medium-fine, strong, and purple at the base, and carries good large heads with plenty of grain. This variety makes into a good class of hay when sown early.

*Thew* is another variety which makes into a good sort of hay. The straw is thin and light-coloured, and carries only a medium quantity of short and erect foliage. It only grew 3 feet 9 inches in the early plot, and much less in the mid-season and late plots. Being an early maturer, it seems that it should be sown late in the season.

*Firbank* is the earliest-maturing variety under trial. Its yields this season do not compare with those of previous trials; apparently it was not suited to the drier conditions and repeated applications of water, for in former years it yielded well above the 100 per cent. mark. Firbank is a scanty grower and poor stooler.

## To Repair Corroded Tanks.

Corrugated iron tanks that show signs of rusting and corroding may have their lives considerably lengthened if the inside of the tank is coated with cement mortar. This may be done as follows:—First brush all rust from the inside surface of the tank and tie around it on the inside wire netting of any mesh (preferably 2 inches), passing the tying wire through small holes in the tank and twitching it up on the outside. Then plaster the sides through the netting with cement mortar made up of three parts clean sand and one part cement. Continue until the netting is covered. In the same way put on the bottom of the tank one inch thickness of the cement mortar.

When this is sufficiently set, a ¼-inch coat of stronger mortar (equal parts sand and cement) should be trowelled on and finished to a smooth face. Finally, a coat of wash, made of 1 lb. washing soda to four gallons water, should be applied. Holes punched from the outside of the tank with a four-inch nail are a help to the keying of the cement, and a convenience for the tie wires. The outside of the tank should be painted when the repairs are finished. As this treatment adds considerably to the weight of the tank, it is necessary to make sure that the stand or supports are strong enough for the purpose.—A. Brooks, Works Overseer.

## Methods of Extracting Wax from the Honeycomb.

To extract wax from combs it is necessary to apply pressure, a wax press being used for the purpose. Melt the combs in boiling water; put in the press a sack (say a sound chaff bag), and pour into this the boiling mass; then fold the top of the sack and apply the screw pressure.

When a press is not available, another method can be used, but with this only a fair percentage of the wax can be obtained. In the second method the comb is put into a sack, the top of this tied, and the whole immersed in boiling water with weights on it to keep it under. When the combs are melted, the top of the sack is lifted, and pressure applied to its contents by twisting. The sack is then immersed again, and pressure applied to it from the top; it is subsequently weighted and allowed to cool.

The second method is obviously imperfect, and a wax press—especially when used for extracting wax from old combs—soon earns the price of its purchase.—W. A. Goodacre, Senior Apiary Inspector.

## Cheap Petrol gives American Farmers an Advantage.

The American farmer has a big advantage over the Australian farmer, because good road construction is a live and popular idea throughout the country, the result being that with good roads as the general rule, the motor truck and the motor car (with trailer) are very much in evidence. In many parts, motor truck service companies operate successfully, even in competition with the railways. Generally speaking, the United States are a network of railways, and capital is quickly available to open up new territory prior to settlement taking place, the builders of these railways relying upon future freightage, or on concessions in the shape of land grants to recoup them for their expenditure. It is obvious that, with such transport facilities, the American farmer is particularly well placed for getting his produce to market, or for the removal of his stock when this is necessary. The first cost to him of motor trucks and cars, and the low cost of petrol (averaging, between States from the Pacific to the Atlantic, about 1s. per gallon, as compared with about four times that amount in Australia) together make the lot of the American farmer very much better than that of our own farmers, and incidentally assist increased production to a large extent. Good roads, plus cheap petrol, bring the cost of upkeep of a truck or car down to a minimum in America.

Realising that the cost of petrol has a vital bearing upon transportation here, I called, during my visit to San Francisco, upon the Union Oil Company (one of the largest oil companies in the States). I discussed with the Assistant to the Vice-president (Mr. T. A. Hays) the possibility of securing petrol for Australia at a substantially lower cost. He expressed the opinion that the only way in which Australia could obtain petrol materially cheaper was by finding its own oil wells. He was further of opinion that an expert oil geologist—the very best procurable—should be brought to Australia, and given full facilities for finding oil, and that, later, an experienced oil driller—not a water driller—should also be procured; and said he would be glad, if the New South Wales Government desired it, to lend a first-class geologist from his own Company.—Extract from a report by Mr. Leslie G. Bridge.

## Cooked *versus* Raw Potatoes as Pig Fatteners.

Experiments were recently carried out by the Department of Agriculture and Technical Instruction for Ireland to determine the comparative values of cooked and of raw potatoes for fattening pigs.

The experiments were carried out at five centres in five counties, and at each centre the pigs were divided into two lots, as even as possible as regards sex, age, weight, and general appearance. The pigs in Lot 1 were given cooked potatoes, and those in Lot 2 raw pulped potatoes, but in all other respects the lots were treated alike. Summarised results show that the pigs to which cooked potatoes were fed made an average daily gain of 1·43lb., while the animals on raw potatoes gained only 1·29lb. In 110 days the former made an increased gain in live weight of almost 16lb. per head more than the latter. The results indicated that, with pork at £6 8s. 9d. per cwt. live weight, a substantial profit was obtained from the cooking of potatoes for fattening pigs.

# Sudan Grass in Western Districts.

## At Cowra Experiment Farm.

C. McCAULEY, Assistant Experimentalist.

A PROFIT of over £100 from 20 acres of Sudan grass in a dry district and a season of indifferent rainfall is a result that should commend the crop to graziers and farmers in the drier portions of the State.

The land was ploughed 6 inches deep with a disc plough between 17th and 30th July, 1919, and an excellent seed-bed, free from weeds, was obtained by spring-tooth cultivating and harrowing just prior to planting from 29th September to 3rd October. Sowing was effected with the wheat drill at 5 lb. per acre, in drills 21 inches apart. Superphosphate was sown with the seed at the rate of 60 lb. per acre.

The germination was good and even ; despite the dry season the crop made steady growth and it was some 18 inches high when useful rains fell early in December. The subsequent growth was rapid, and the grass was soon 4 feet 6 inches high. A strong second growth appeared at the base of the plants. On 24th December the crop had reached the late flowering stage and was cut for silage. The yield was good, averaging 25 cwt. per acre, or 25 tons in all.

A very succulent growth followed, and was fed off to the cattle between 1st and 6th January. The cattle ate the grass readily, and it proved itself of good feeding value by the increased milk yield during that period.

The crop was harrowed crosswise on 7th January, and on 9th February the second growth was cut for hay when it was 4 feet high. The green weight of the stuff was 1 ton per acre, and the dry weight 12 cwt., or 12 tons in all.

The stubble was again fed off by the cows, which were turned in from 15th to 23rd February. Another harrowing was given on 24th February, but owing to the hot dry weather prevailing the third growth was rather slow. Good rain fell on 12th and 13th March, and the crop made a quick recovery, and late in April was 3 feet 6 inches in height and setting a good crop of seed which it was intended to harvest. However, early frosts caught the crop, and as there was no chance of the seed maturing, it was decided on 10th May to graze the crop off. For several weeks twenty-one head of cattle and one horse were run on the area, and following these 400 sheep got a week's feed off it. In such a season, the value of the grazing is very conservatively estimated at £40.

The rainfall for the various periods of growth was as follows :—

RAINFALL during Growing Period.

| For First Cut. | | For Second Cut. | | For Third Growth.* | |
|---|---|---|---|---|---|
| October ... | 90 points. | December... | 249 points. | February... | 27 points. |
| November ... | 25 ,, | January ... | 164 ,, | March ... | 142 ,, |
| December .. | 194 ,, | | | April .. | 170 ,, |
| Total ... | 309 ,, | Total ... | 413 ,, | Total ... | 339 ,, |

* The third growth was not actually harvested.

Upon the results of this trial it can be said that Sudan grass has proved itself a valuable crop for the district for (*a*) hay or silage, and (*b*) grazing.

During the hot, dry summer months it provided green succulent growth, when even the cultivated native grasses were absolutely dry. The butter-fat tests for the month of April were of higher percentage than usual. Several of the cows were tested a second time to ascertain if the first had been correct. The milking herd, during this period, were depastured on the Sudan grass alone, but there was not sufficient for them to be allowed all they wanted, and they were only permitted to remain until it was considered they had had a sufficient ration. The milk yield therefore suffered in quantity.

Samples of Sudan grass hay, oaten chaff, wheaten chaff, and wheaten hay were forwarded from the farm to the chemist, Mr. Guthrie, who subsequently reported the results of his analyses to be as follows :—

| | Water, per cent. | Ash, per cent. | Albuminoids, per cent. | Carbohydrates, per cent. | Ether Extract, per cent. | Crude Fibre, per cent. | Albuminoid Ratio. | Nutritive Value. |
|---|---|---|---|---|---|---|---|---|
| Sudan grass...... | 10·70 | 6·40 | 9·18 | 54·62 | 1·94 | 17·16 | 1 : 6·4 | 68 |
| Oaten chaff ...... | 12·5 | 3·1 | 4·3 | 46·0 | 0·9 | 33·2 | 1 : 11·2 | 52 |
| Wheaten chaff... | 13·1 | 5·8 | 4·8 | 44·0 | 1·3 | 31·0 | 1 : 9·8 | 51 |
| Wheaten hay ... | 11·0 | 7·1 | 9.4 | 46·7 | 2·7 | 23·1 | 1 : 5·6 | 62 |

A sample of silage made from Sudan grass was also forwarded to Mr. Guthrie for analysis, with the following result :—

| | | |
|---|---|---|
| Moisture ... ... ... ... | 64·89 | per cent. |
| Albuminoids ... ... .. ... | 4·24 | ,, |
| Ether extract ... ... ... ... | 1·16 | ,, |
| Ash ... ... ... ... ... | 3·22 | ,, |
| Fibre ... ... ... ... ... | 10·34 | ,, |
| Carbohydrates... ... ... ... | 16·15 | ,, |
| | 100·00 | ,, |

Albuminoid ratio ... 1 to 4·4.

Nutritive value ... 23.

Fixed acidity, calculated as sulphuric acid ... 0·19 per cent.

Volatile acidity, calculated as sulphuric acid ... 0·12 ,,

## Financial Statement.

The following statement shows the total outlay on the paddocks, and then presents the various costs allocated to the several crops obtained :—

| Operation and Cost. | Total Outlay. | | | Cost of Silage. | | | Cost of Hay. | | | Cost of Grazing Crop. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | £ | s. | d. | £ | s. | d. | £ | s. | d. | £ | s. | d. |
| Ploughing, at 6s. 10d. per acre ... ... | 6 | 16 | 8 | 2 | 5 | 7 | 2 | 5 | 7 | 2 | 5 | 6 |
| Spring-tooth cultivation, at 2s. 5d. per acre | 2 | 8 | 4 | 0 | 16 | 2 | 0 | 16 | 1 | 0 | 16 | 1 |
| Drilling, at 2s. 11d. per acre ... ... | 2 | 11 | 8 | 0 | 17 | 2 | 0 | 17 | 3 | 0 | 17 | 3 |
| Seed, at 1s. per lb. ; 5 lb. per acre ... | 5 | 0 | 0 | 1 | 13 | 4 | 1 | 13 | 4 | 1 | 13 | 4 |
| Superphosphate, at £6 per ton; 60 lb. per acre ... ... ... ... ... ... | 3 | 4 | 3 | 1 | 1 | 5 | 1 | 1 | 5 | 1 | 1 | 5 |
| Wages, four men, four days (cutting, carting, and chaffing silage), at 12s. 10d. per day ... ... ... ... ... | 11 | 4 | 0 | 11 | 4 | 0 | ...... | | | ...... | | |
| Kerosene oil consumed, 1 tin ... .. | 0 | 7 | 9 | 0 | 7 | 9 | ...... | | | ...... | | |
| Eleven horses, three days, at 3d. per hour per horse .. ... ... ... ... | 3 | 12 | 2 | 3 | 12 | 2 | ...... | | | ...... | | |
| Depreciation on plant, 5s. per acre ... | 5 | 0 | 0 | 5 | 0 | 0 | ...... | | | ...... | | |
| Binder twine, two balls, 3s. each ... ... | 0 | 6 | 0 | 0 | 6 | 0 | ...... | | | ...... | | |
| Oil consumed, 1 quart ... ... ... | 0 | 1 | 3 | 0 | 1 | 3 | ...... | | | ...... | | |
| Harrowing, at 7d. per acre ... ... ... | 0 | 11 | 8 | ...... | | | 0 | 11 | 8 | ...... | | |
| Wages, three men, four days (cutting, carting, stooking, and stacking hay), at 12s. 10d. per day ... ... .. ... | 8 | 8 | 0 | ...... | | | 8 | 8 | 0 | ...... | | |
| Six horses, three days, cutting and carting hay ... ... ... ... ... ... | 1 | 17 | 10 | ...... | | | 1 | 17 | 10 | ...... | | |
| Depreciation on plant, 5s. per acre ... | 5 | 0 | 0 | ...... | | | 5 | 0 | 0 | ...... | | |
| Binder twine, two balls, 3s. each ... .. | 0 | 6 | 0 | ...... | | | 0 | 6 | 0 | ...... | | |
| Harrowing, at 7d. per acre ... ... ... | 0 | 11 | 8 | ...... | | | ...... | | | 0 | 11 | 8 |
| Oil consumed, 1 quart ... .. ... | 0 | 1 | 3 | ...... | | | 0 | 1 | 3 | ...... | | |
| Rental of land valued at £10 per acre. 9 months ... ... ... ... ... | 7 | 10 | 0 | 2 | 10 | 0 | 2 | 10 | 0 | 2 | 10 | 0 |
| Total ... ... ... £ | 64 | 18 | 6 | 29 | 14 | 10 | 25 | 8 | 5 | 9 | 15 | 3 |

### Summary.

| | £ | s. | d. |
|---|---|---|---|
| *Credit.* | | | |
| By 12 tons of hay, at £6 per ton ... ... ... | 72 | 0 | 0 |
| 25 tons silage, at £2 ,, ... ... ... | 50 | 0 | 0 |
| Two weeks' grazing eighteen cows, at 2s. 6d. per head per week ... ... ... ... .. | 4 | 10 | 0 |
| Estimated value of grazing on third growth ... | 40 | 0 | 0 |
| | £166 | 10 | 0 |
| *Debit.* | | | |
| To costs as per above table ... ... ... ... | 64 | 18 | 6 |
| Balance, profit... ... ... ... | £101 | 11 | 6 |

# Under Irrigation with Bore Water.

W. R. COLWELL.*

Excellent returns were obtained from Sudan grass at Coonamble Experiment Farm last season with the assistance of irrigation from bore water.

An area of 30 acres, which two years before had carried a heavy crop of broadcast maize and then a crop of wheat that failed, was disced, and then

**Sudan Grass at Coonamble Experiment Farm.**

**A Heavy Crop being cut for Silage at Coonamble.**

sown in September, 1919, with Sudan grass at the rate of 8 lb. per acre. About 75 per cent. of the seed germinated, and the growth being good, the area was divided into eight blocks and irrigated by flooding.

* Late Manager, Coonamble Experiment Farm.

The first growth cut 300 bags of chaff, from the second growth the seed was stripped (a very satisfactory yield being obtained), and the third growth was fed off, 730 sheep being depastured on it and kept in good condition for several weeks.

The accompanying illustrations serve to indicate how heavy was the growth. Only three floodings were given, but the crop was a notable success, and proves the value of fodder crops under irrigation in districts where bore water is available. Many graziers in the Coonamble district were much impressed by the results obtained, and affirmed their intention to make plantings in the future.

## In a Dry Season at Parkes.

J. E. SYME, Inspector of Agriculture.

That Sudan grass is one of the best summer fodder plants to grow in western districts was fully demonstrated at Parkes, even in the dry season just experienced. The fact that it will grow to a height of 4 and 5 feet when natural herbage is entirely absent is sufficient indication of its drought resistance. There have been failures in different districts, it is true, but they can usually be accounted for by almost entire absence of rain. In two cases mentioned below, profitable crops were raised on very light rainfalls, heavy rain only falling when the Sudan grass had practically matured.

On 12th October, Mr. W. W. Watson, Tichborne, planted 50 acres. The land had been disc-cultivated in July, 1919, and the only rain before sowing was 37 points on 5th September. The seed was sown at 4 lb. to the acre without manure, and germinated well in places. The rainfall after sowing was 25 points in October, 44 points in November, and 362 points in December—the last coming when the grass had nearly matured.

In the third week in December, 3 acres that had germinated well were cut with the binder, made into hay, then put through the chaffcutter, and finally through the harvester operated by an engine to thrash out the seed, of which 500 lb. was obtained from the 3 acres. Of this seed, 400 lb. was sold for 2s. 6d. per lb., and the chaff was used to feed horses, the seed and chaff giving a very handsome return.

At the end of January, twenty-five head of cattle and twelve horses were pastured on the paddock and put in condition. They remained there until the third week in March, when sheep were turned on to clean it up.

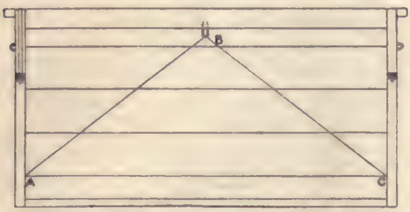
In the second case, the manager of Mr. R. Shelton's property, "Elimvale," at Nelungaloo, on 25th September, 1919, planted 30 acres of Sudan grass, using 6 lb. of seed to the acre, with 54 lb. of superphosphate. The land had been ploughed about 4 inches deep the last week in September, 1919, with disc plough, harrowed, and dragged with a couple of logs to get a fine tilth just before planting. The germination was poor, but the grass grew to a height of 5 feet. On 6th September, just before

sowing, 35 points of rain were registered, and the rainfall after sowing was 15 points on 26th September, 22 points on 28th September, and 333 points in December. The crop was fed off, thirty-one horses and eleven head of cattle being turned in on 7th January, 1920, and getting six weeks solid feed in it. Indeed, they have been grazing on it ever since, as it keeps growing until the frost kills it.

Both the farmers are of the opinion that Sudan grass is the best summer fodder they have yet grown, and that—while belonging to the sorghum family—it is not poisonous at any stage.

## An Improved Method of Wiring Bee-hive Frames.

A method of wiring frames that is well worth the attention of the local apiarist is described by E. R. Root in a recent issue of *Gleanings in Bee Culture* (from which the accompanying figure is taken). Bee-keepers to whom the improvement appeals have a good opportunity of applying it during the winter adjustment of material.




It will be seen that the only way in which the method of wiring differs from that usually practised is that a fifth (or in shallow supers, a third) strand is run from the hole A, through a staple at B, to the hole C. This reinforcement prevents the foundation from stretching near the top bar, with the consequence that in many cases the queen is induced to lay right up to the top bars of the frame. The queen does not care to lay in cells that are stretched, for they are neither drone nor worker cells.—W. A. Goodacre, Senior Apiary Inspector.

## Soil Analyses for Farmers.

It must be pointed out that, as a rule, the analysis of an isolated sample of a soil that has been variously cropped and manured for a number of years is of little practical value. It [the analysis] cannot be expected to yield results which can be used as an accurate and infallible guide towards supplying rationally and with an expectation of profit the soil's manurial requirements. Agricultural chemists are unanimous in the opinion that the results of such an analysis are in no degree commensurate with the work involved in obtaining them. Trials on the field itself can alone furnish the desired information.—Frank T. Shutt, M.A., D.Sc., Dominion Chemist, Canadian Department of Agriculture.

## Boiled Wheat for Poultry.

The palatability of wheat is increased by boiling, steaming, or soaking in hot water, but this treatment does not increase the food value in any way, nor does the fact that the wheat becomes more bulky make it the more economical as a feed.—James Hadlington, Poultry Expert.

# Sorghum as a Possible Source of Industrial Alcohol.

A. A. RAMSAY, Principal Assistant Chemist.

THE following varieties of sorghum grown at Hawkesbury Agricultural College, Richmond, were lately examined as to their suitability for the production of industrial alcohol:—(1) Early Amber Cane, (2) No. 47, (3) No. 54, (4) No. 51, (5) No. 49, (6) *Sorghum saccharatum*, (7) Planter's Friend, (8) No. 34, (9) Saccaline. Nos. 34 to 54 are selected varieties of Planter's Friend. All the varieties were examined at the same relative state of ripeness.

A hundredweight of the sorghum was divested of leaves, the top portion carrying the seed was removed, and the remaining canes were crushed in an experimental mill (power driven) which was kindly loaned for this work by the Colonial Sugar Refining Company, Ltd. The mill, a two-roller one, was set very close ($\frac{3}{32}$ of an inch), so close, in fact, that the stalks would just pass through without pulling the mill up. The expressed juice was collected and examined.

The results obtained are set forth in Table I. It will be noted that the yield of sorghum in the field ranged from 5·5 to 17·6 tons per acre, and the average yield of all varieties was 14 tons per acre. The "tops" or heads of the sorghum varied from 8·9 to 26·8 per cent. of the total weight of growing sorghum, the mean being 13·9 per cent., and the leaves varied from 10·7 to 20·7 per cent., the mean being 14·3 per cent. The percentage of clean stalks varied from 60·7 to 80·4, the mean being 71·9 per cent.

The yield of juice expressed by single crushing also showed wide variations, viz., from 20 per cent. to 36 per cent., the mean yield being 27·7 per cent. of the weight of the clean stalks crushed. The yield of juice will be dealt with later.

The sucrose content of the juice expressed ranged from 4·7 to 14·8 per cent., with an average of 9·99 per cent. The fruit sugar content ranged from 2·1 to 4·5 per cent., the average being 3·08 per cent.

From the composition of the juice as stated above, the theoretical yield of alcohol has been calculated, using Pasteur's figures, and the yield is further expressed as imperial gallons of 95 per cent. alcohol. Pasteur's figures have not been realised in actual distillery practice. These figures were obtained from pure sugar solutions and nutrient media, therefore the yield of alcohol in practice might be appreciably reduced.

The figures obtained show that the yield of 95 per cent. alcohol ranges from 6·8 to 113 gallons per acre, with an average of 52·7 gallons, or expressed in terms of 1 ton clean canes, the yield ranged from 2·03 to 7·99 gallons with a mean of 4·35 gallons.

It is difficult to arrive at the money value of a ton of sorghum, since the sorghum is usually consumed on the farm where it is grown, and it is rarely if ever sold. The practice a good few years ago was to charge sorghum as being worth 10s. per ton for fodder. The prices of all fodders have advanced very considerably within the past two years, chaff being at present about £12 per ton. It appears therefore that sorghum ought to be worth considerably more than 10s. per ton, and that 16s. or 18s. would be a more correct figure*. Sugar-cane is worth about 40s. per ton in the field with a yield at least as high as sorghum, and costing no more in labour to produce it.

To this figure would have to be added the cost of cutting, trashing, and transport, which might easily cost 6s. per ton.

The 95 per cent. alcohol from sorghum, as grown, must be produced and sold at 1s. 1½d. per gallon to enable it to exist as an industry. Industrial 95 per cent. alcohol is at present sold at 1s. 4½d. per gallon, and methylating or denaturing costs about 3d. per gallon, leaving 1s. 1½d. as the price at which 95 per cent. alcohol must be produced.

Now, one ton of sorghum as grown in the field and of the mean quality stated in Table I, would produce 3·49 gallons of 95 per cent. alcohol if theoretical results be obtained, or 3·14 gallons 95 per cent. alcohol if the usual 90 per cent. of theoretical result be obtained; these would require to be sold at 3s. 11d. or 3s. 6¼d. respectively. The cost of cutting, trashing, and transport would therefore exceed the market value of the alcohol produced. On the mean figures given in Table I, the manufacture of industrial alcohol could not be successfully carried on.

### Percentage of Juice Extracted.

Referring further to the percentage of juice extracted from sorghum canes by crushing in sugar mills, the following extract taken from "Sugar" by Lock and Newlands, published by E. F. M. Spon, 1888, page 534, is of interest:—"It was found that on account of the spongy and loose texture of the canes [sorghum] it was impossible with the heaviest and most modern crushers to extract more than 40 per cent. of the juice by the process adopted, which was similar to those used in the . . . . [sugar industry]."

The results obtained from the Hawkesbury sorghums gave 36 per cent. as a maximum, and 27·7 per cent. as an average value for the juice expressed.

The effect of the spongy nature of the sorghum canes is shown better in Tables III and IIIA. In Table III it will be seen that there is more sugar left in the megass than is expressed in the juice by single crushing.

Table IIIA shows this perhaps more clearly. In the variety Planter's Friend 44 per cent. of the total sugars in the sorghum were expressed in the juice, while 56 per cent. remained in the megass.

Similarly, variety No. 34 yielded 36 per cent. in the juice, leaving 64 per cent. in the megass, and Saccaline 42 per cent. in the juice and 58 per cent. in the megass.

* Since this was written, sorghum has been sold on the Sydney market at £3 10s. per ton.—A.A.R.

### Resu t of Two Crushings.

The yield of juice expressed from the sorghum canes by passing once through the rollers of the experimental mill (Table I) was so low that in four cases, as detailed in Table II, the canes, after being crushed once, were returned to the rollers and crushed a second time. Yields of juice were thus expressed, ranging from 5·3 to 10·7 per cent., with an average of 7·90 per cent. of the weight of the original canes. The total weight of the juice expressed from these varieties was 29·88, 40·82, 40·78, and 41·28 per cent. of the original canes, and the average yield was 38·19 per cent. Even this yield is very much below the anticipated yield of 65 to 75 per cent.

When the canes were subjected to two crushings—that is, when the first megass was again put through the rollers—the average of the three varieties showed that 49·86 per cent. of the total sugars were in the juice, the balance (50·13 per cent.), remaining in the second megass.

The extractions of 65 to 75 per cent. as mentioned in Bulletin No. 6* have not been realised in this series of trials by crushing, but the above figures might be obtained by diffusion, or a combination of diffusion and crushing. With powerful mills, such as are used in sugar factories, it might be possible to increase the extraction to a higher figure than has been obtained with the experimental mill, though experiments made elsewhere indicate that there are serious practical difficulties.

In sugar practice it is possible, with modern plant, to get a sugar-cane megass containing as high as 50 per cent of fibre, whereas the average fibre in the sorghum megass was 19·59 per cent., and the less fibre there is the more juice there must be.

### Yields from Crushing Twice.

The second crushing has therefore resulted in an increased yield of 95 per cent. alcohol of 0·9 gallon to 1·9 gallon, with an average of 1·38 gallon of 95 per cent. alcohol per ton of clean canes. At the present market value of alcohol this would be worth 1s. 11d.

This would increase the average yield of the total alcohol obtained from a ton of clean canes of the five varieties mentioned in Table II from 5·35 to 6·73 gallons. If this increase obtains on the whole series, then the 4·85 gallons of 95 per cent. alcohol yielded per ton by clean canes in Table I would be increased to 6·10 gallons as a theoretical yield. Since 100 tons sorghum in the field is equal to 71·87 tons clean cane, 1 ton sorghum in the field would yield 4·38 gallons 95 per cent. alcohol, provided absolutely theoretical results were obtained, and at 1s. 1½d. per gallon would be worth 4s. 11d. If, however, only 90 per cent. of the theoretical yield of alcohol be obtained, only 3·95 gallons 95 per cent. alcohol would be obtained, which at 1s. 1½d. per gallon would be worth 4s. 5¼d. Apparently, then, the cost of cutting, trashing, and transport of the sorghum exceeds the value of the alcohol that has been produced.

*Bulletin No. 6, Power Alcohol, Advisory Council of Science and Industry, 1918, page 22.

TABLE I.—Results obtained on Crushing different varieties of Sorghum. (Single crushing.)

| Variety of Sorghum. | Date of Planting. | Date of Cutting. | Yield of Sorghum per acre. | Percentage composition of Sorghum. | | | Result on milling 100lb clean canes. | | Chemical analysis of juice. Per cent. by weight. | | | | | | Yield per acre. | | | | | | Alcohol 95 % per ton clean stalks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Tops. | Leaves. | Clean Stalks. | Juice. | Megass. | Cane sugar. | Fruit sugar. | Other organic matter. | Total solids. | Quotient. | Glucose ratio. | Clean Stalks. | Juice. | Sucrose. | Fructose. | Alcohol = total sugars. | Alcohol 95 % by volume. | |
| | | | tons. | | | | | | | | | | | | tons. | lb. | lb. | lb. | lb. | gal. | gal. |
| Early Amber Cane .. .. | 21/10/19 | 4/3/20 | 14·3 | 22·22 | | 77·78 | 25·90 | 74·10 | 14·84 | 2·20 | 1·78 | 18·82 | 78·9 | 14·8 | 11·122 | 6,452·9 | 957·6 | 142·0 | 558·31 | 68·41 | 6·15 |
| No. 47 .. .. | 21/10/19 | 4/3/20 | 17·05 | 10·81 | 20·72 | 68·47 | 30·83 | 69·17 | 9·80 | 3·13 | 1·53 | 14·46 | 67·8 | 31·9 | 11·674 | 8,062·0 | 790·1 | 252·3 | 526·21 | 64·49 | 5·52 |
| No. 54 .. .. | 21/10/19 | 10/3/20 | 5·5 | 26·79 | 12·50 | 60·71 | 20·04 | 79·96 | 4·67 | 2·70 | 2·14 | 9·51 | 48·9 | 57·8 | 3·339 | 1,498·9 | 70·0 | 40·5 | 55·42 | 6·79 | 2·03 |
| No. 51 .. .. | 21/10/19 | 10/3/20 | 11·5 | 8·93 | 13·39 | 77·68 | 29·09 | 70·91 | 9·91 | 4·20 | 2·42 | 16·53 | 60·0 | 42·4 | 8·661 | 5,646·5 | 559·6 | 237·2 | 401·08 | 49·15 | 5·67 |
| No. 49 .. .. | 21/10/19 | 10/3/20 | 18·7 | 15·18 | 16·07 | 68·75 | 22·47 | 77·53 | 6·21 | 4·50 | 2·72 | 13·43 | 46·2 | 72·5 | 12·856 | 6,470·8 | 401·8 | 291·2 | 306·45 | 37·15 | 2·92 |
| *Sorghum saccharatum*.. | 21/10/19 | 10/3/20 | 13·2 | 17·41 | 18·30 | 64·29 | 21·44 | 78·56 | 9·09 | 3·30 | 3·10 | 15·49 | 58·7 | 36·3 | 8·486 | 4,075·4 | 370·5 | 134·5 | 254·61 | 31·20 | 3·68 |
| Planter's Friend .. | 21/10/19 | 15/3/20 | 16·2 | 14·73 | 15·18 | 70·09 | 33·77 | 66·23 | 10·74 | 2·67 | 1·63 | 15·04 | 71·4 | 24·9 | 11·355 | 6,020·1 | 646·6 | 160·7 | 408·43 | 50·01 | 4·04 |
| No. 34 .. .. | 21/10/19 | 23/3/20 | 12·1 | 11·61 | 10·71 | 77·68 | 30·01 | 69·99 | 10·77 | 2·87 | 2·83 | 16·47 | 65·4 | 26·6 | 9·399 | 6,318·4 | 680·5 | 181·3 | 435·75 | 53·39 | 5·68 |
| Saccaline .. .. | 21/10/19 | 23/3/20 | 17·6 | 8·93 | 10·71 | 80·36 | 35·94 | 64·06 | 13·86 | 2·10 | 2·23 | 18·19 | 76·2 | 15·2 | 14·143 | 11,386·2 | 1,578·1 | 239·1 | 922·55 | 113·04 | 7·99 |
| Total .. .. | .. | .. | 126·15 | .. | .. | 646·81 | 249·49 | 650·51 | 89·89 | 27·67 | 20·38 | 137·94 | .. | .. | 91·035 | 46,231·2 | 6,054·8 | 1,678·8 | 3,868·81 | 474·03 | 43·68 |
| Average .. | .. | .. | 14·02 | 13·87 | 14·26 | 71·87 | 27·72 | 72·28 | 9·99 | 3·08 | 2·26 | 15·33 | 65·2 | 30·8 | 10·12 | 5,136·8 | 683·9 | 186·5 | 429·87 | 52·67 | 4·85 |

TABLE II.—Additional Juice extracted by passing Megass through the mill a second time.

| Variety of Sorghum. | Date of Planting. | Date of Cutting. | Yield of Sorghum per acre. | Tops. | Leaves. | Clean Stalks. | Juice. | Megass. | Cane sugar. | Fruit sugar. | Other organic matter. | Total solids. | Quotient. | Glucose ratio. | Clean Stalks. | Juice. | Sucrose. | Fructose. | Alcohol = total sugars. | Alcohol 95 % by volume. | Alcohol 95 % per ton clean stalks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sorghum saccharatum*. | .. | .. | .. | .. | .. | .. | 8·44 | 70·12 | 9·11 | 3·28 | 3·21 | 15·60 | 58·4 | 36·0 | .. | 1,604·3 | 146·2 | 52·6 | 100·24 | 12·28 | 1·45 |
| Planter's Friend .. | .. | .. | .. | .. | .. | .. | 7·05 | 59·18 | 10·41 | 2·66 | 1·97 | 15·04 | 69·9 | 25·6 | . | 1,256·8 | 130·8 | 33·4 | 83·05 | 10·18 | 0·90 |
| No. 34 .. .. | .. | .. | .. | .. | .. | .. | 10·77 | 59·22 | 10·86 | 2·12 | 3·68 | 16·66 | 65·2 | 19·5 | .. | 2,267·6 | 246·3 | 48·1 | 149·22 | 18·28 | 1·94 |
| Saccaline .. .. | .. | .. | .. | .. | .. | .. | 5·34 | 58·72 | 14·33 | 1·97 | 2·00 | 18·30 | 78·3 | 13·7 | .. | 1,691·8 | 242·4 | 33·1 | 140·04 | 17·16 | 1·21 |
| Total .. .. | .. | .. | .. | .. | .. | .. | 31·60 | 247·24 | 44·71 | 10·03 | 10·86 | 65·60 | .. | .. | .. | 6,820·5 | 765·7 | 167·2 | 472·55 | 57·90 | 5·50 |
| Average .. | .. | .. | .. | .. | .. | .. | 7·90 | 61·81 | 11·18 | 2·51 | 2·71 | 16·40 | 68·2 | 22·5 | .. | 1,705·1 | 191·4 | 41·8 | 118·14 | 14·48 | 1·38 |

SUMMARY of Juice obtained as the result of Sorghum being crushed twice. (Sum of figures in Tables I and II.)

| Variety of Sorghum. | Date of Planting. | Date of Cutting. | Yield of Sorghum per acre. | Tops. | Leaves. | Clean Stalks. | Juice. | Megass. | Cane sugar. | Fruit sugar. | Other organic matter. | Total solids. | Quotient. | Glucose ratio. | Clean Stalks. | Juice. | Sucrose. | Fructose. | Alcohol = total sugars. | Alcohol 95 % by volume. | Alcohol 95 % per ton clean stalks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sorghum saccharatum*. | .. | .. | 13·2 | 17·41 | 18·30 | 64·29 | 29·88 | 70·12 | .. | .. | .. | .. | .. | . | 8·486 | 5,679·7 | 516·7 | 187·1 | 354·85 | 43·48 | 5·13 |
| Planter's Friend .. | .. | .. | 16·2 | 14·73 | 15·18 | 70·09 | 40·82 | 59·18 | .. | .. | .. | .. | .. | .. | 11·355 | 7,276·9 | 777·4 | 194·1 | 491·48 | 60·19 | 4·94 |
| No. 34 .. .. | .. | .. | 12·1 | 11·61 | 10·71 | 77·68 | 40·78 | 59·22 | .. | .. | .. | .. | .. | .. | 9·399 | 8,586·0 | 926·8 | 229·4 | 584·97 | 71·67 | 7·62 |
| Saccaline .. .. | .. | .. | 17·6 | 8·93 | 10·71 | 80·36 | 41·28 | 58·72 | .. | .. | .. | .. | .. | .. | 14·143 | 13,078·0 | 1,820·5 | 272·2 | 1,062·59 | 130·20 | 9·20 |
| Total .. .. | .. | .. | 59·1 | 52·68 | 54·90 | 272·42 | 152·76 | 247·24 | .. | .. | .. | .. | . | .. | 43·381 | 34,620·6 | 4,041·4 | 882·8 | 2,493·89 | 305·54 | 26·[illegible] |
| Average .. | .. | .. | 14·78 | 13·17 | 13·73 | 78·10 | 38·19 | 61·81 | .. | .. | .. | .. | .. | .. | 10·85 | 8,655·2 | 1,010·4 | 220·7 | 623·47 | 76·39 | 6·73 |

TABLE III.—Showing connection between Original Canes and Products of Milling.—(Juice and Megass).

| Variety of Sorghum. | Mill Products. | Expressed as percentage by weight of clean canes. | Percentage Composition by Analysis. | | | | | | 100 Pounds Clean Cane contains (pounds) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cane Sugar. | Fruit Sugar. | Other Organic Matter. | Total Soluble Solids. | Fibre. | Water. | Cane Sugar. | Fruit Sugar. | Other Organic Matter. | Total Soluble Solids. | Fibre. | Water. |
| Planter's Friend | First Juice | 33·77 | 10·74 | 2·67 | 1·63 | 15·04 | .. | 84·96 | 3·6269 | ·90166 | ·55045 | 5·07901 | .. | 28·69099 |
| | First Megass | 66·23 | 8·21 | 0·46 | 3·46 | 12·13 | 18·44 | 69·43 | 5·4375 | ·30466 | 2·29156 | 8·03370 | 12·21281 | 45·98349 |
| | Clean Canes | 100·00 | 9·06 | 1·21 | 2·84 | 13·11 | 12·21 | 74·68 | 9·0644 | 1·20632 | 2·84201 | 13·11271 | 12·21281 | 74·67448 |
| | First Juice | 33·77 | 10·74 | 2·67 | 1·63 | 15·04 | .. | 84·96 | 3·6269 | ·90166 | ·55045 | 5·07901 | .. | 28·69099 |
| | Second Juice | 7·05 | 10·41 | 2·66 | 1·97 | 15·04 | .. | 84·96 | ·7339 | ·18753 | ·13889 | 1·06032 | .. | 5·98968 |
| | Second Megass | 59·18 | 7·94 | 0·20 | 3·64 | 11·78 | 20·64 | 67·58 | 4·7036 | ·11713 | 2·15267 | 6·97338 | 12·21281 | 39·99381 |
| | Clean Canes | 100·00 | 9·06 | 1·21 | 2·84 | 13·11 | 12·21 | 74·68 | 9·0644 | 1·20632 | 2·84201 | 13·11271 | 12·21281 | 74·67448 |
| No. 34 | First Juice | 30·01 | 10·77 | 2·87 | 2·83 | 16·47 | .. | 83·53 | 3·232077 | ·861287 | ·849283 | 4·942647 | .. | 25·067353 |
| | First Megass | 69·99 | 8·92 | 1·53 | 1·66 | 12·11 | 18·22 | 69·67 | 6·243108 | 1·070847 | 1·161834 | 8·475789 | 12·752178 | 48·762033 |
| | Clean Canes | 100·00 | 9·48 | 1·93 | 2·01 | 13·42 | 12·75 | 73·83 | 9·475185 | 1·932134 | 2·011117 | 13·418436 | 12·752178 | 73·829386 |
| | First Juice | 30·01 | 10·77 | 2·87 | 2·83 | 16·47 | .. | 83·53 | 3·232077 | ·861287 | ·849283 | 4·942647 | .. | 25·067353 |
| | Second Juice | 10·77 | 10·86 | 2·12 | 3·68 | 16·66 | .. | 83·34 | 1·169622 | ·228324 | ·396336 | 1·794282 | .. | 8·975718 |
| | Second Megass | 59·22 | 8·57 | 1·42 | 1·29 | 11·28 | 21·53 | 67·19 | 5·073486 | ·842523 | ·765498 | 6·681507 | 12·752178 | 39·786315 |
| | Clean Canes | 100·00 | 9·48 | 1·93 | 2·01 | 13·42 | 12·75 | 73·83 | 9·475185 | 1·932134 | 2·011117 | 13·418436 | 12·752178 | 73·829386 |
| Saccaline | First Juice | 35·94 | 13·86 | 2·10 | 2·23 | 18·19 | .. | 81·81 | 4·981284 | ·754740 | ·801462 | 6·537486 | .. | 29·402514 |
| | First Megass | 64·06 | 11·16 | 1·20 | 1·77 | 14·13 | 17·55 | 68·32 | 7·149096 | ·768720 | 1·133862 | 9·051678 | 11·242530 | 43·765792 |
| | Clean Canes | 100·00 | 12·13 | 1·52 | 1·94 | 15·59 | 11·24 | 73·17 | 12·130380 | 1·523460 | 1·935324 | 15·589164 | 11·242530 | 73·168306 |
| | First Juice | 35·94 | 13·86 | 2·10 | 2·23 | 18·19 | .. | 81·81 | 4·981284 | ·754740 | ·801462 | 6·537486 | .. | 29·402514 |
| | Second Juice | 5·34 | 14·33 | 1·97 | 2·00 | 18·30 | .. | 81·70 | ·765222 | ·105198 | ·106800 | ·977220 | .. | 4·362780 |
| | Second Megass | 58·72 | 10·87 | 1·13 | 1·75 | 13·75 | 19·14 | 72·21 | 6·383874 | ·663522 | 1·027062 | 8·074458 | 11·242530 | 42·403012 |
| | Clean Canes | 100·00 | 12·13 | 1·52 | 1·94 | 15·59 | 11·24 | 73·17 | 12·130380 | 1·523460 | 1·935324 | 15·589164 | 11·242530 | 73·168306 |

TABLE IIIA.—Showing distribution of total Sugars in clean canes between Juice and Megass.

| | | | |
|---|---|---|---|
| *Planter's Friend*— | | | |
| Single crushing | 1st juice contains | 44·09 | per cent. of the total sugars in canes. |
| | 1st megass contains | 55·91 | ,, ,, ,, |
| Twice crushing | 1st juice contains | 44·09 | ,, ,, ,, |
| | 2nd juice contains | 8·97 | ,, ,, ,, |
| | 2nd megass contains | 46·94 | ,, ,, ,, |
| *No. 34*— | | | |
| Single crushing | 1st juice contains | 35·88 | ,, ,, ,, |
| | 1st megass contains | 64·12 | ,, ,, ,, |
| Twice crushing | 1st juice contains | 35·88 | ,, ,, ,, |
| | 2nd juice contains | 12·26 | ,, ,, ,, |
| | 2nd megass contains | 51·86 | ,, ,, ,, |
| *Saccaline*— | | | |
| Single crushing | 1st juice contains | 42·01 | ,, ,, ,, |
| | 1st megass contains | 57·99 | ,, ,, ,, |
| Twice crushing | 1st juice contains | 42·01 | ,, ,, ,, |
| | 2nd juice contains | 6·38 | ,, ,, ,, |
| | 2nd megass contains | 51·61 | ,, ,, ,, |

## Conclusions.

The market value of the alcohol obtained as an average of all the varieties tried, crushing the canes once, would not pay for the cost of cutting and transporting the sorghum to the factory, if the manufacture was carried out on a large scale.

In the case of the best variety tried (using a single crushing) the value of the alcohol obtained would leave a margin of about 1s. 2d. per ton of sorghum as grown, if theoretical yields of alcohol were obtained, or about 6d. per ton if the usual 90 per cent. of theoretical yield of alcohol were obtained.

Even if a second crushing were resorted to, the case of sorghum as a source of industrial alcohol is not materially improved, and the value of the alcohol obtained would still be less than the actual cost of cutting and transporting the sorghum.

In the case of the best variety in the series, crushed twice, the market value of the alcohol obtained would leave a margin of about 2s. 2¾d. per ton sorghum in the field if the theoretical yield of alcohol were obtained, or about 1s. 5¾d. per ton if only 90 per cent. of the theoretical yield of alcohol were obtained.

It does not appear to be possible to manufacture alcohol from sorghum at a cost which would enable it to compete with the present industrial alcohol as manufactured from molasses.

With powerful mills, such as are used in modern sugar factories, it might be possible to increase the extraction to a higher figure, though from experiments made elsewhere there appear to be serious practical difficulties.

## PLANTING OUT ELEPHANT GRASS.

SECTIONS of Elephant grass for planting out should be cut in the spring, as soon as the new growth shoots from the mature stems. Three joints of a mature stem should be taken, the severance being made near the lower joint, and two joints should be covered in the soil. Planting almost horizontally is perhaps more successful than upright.—E. BREAKWELL, Agrostologist.

# Dairy Produce Factory Premises and Manufacturing Processes.

## THE APPLICATION OF SCIENTIFIC METHODS TO THEIR EXAMINATION.

[Continued from page 337.]

L. T. MacINNES, Dairy Expert, and H. H. RANDELL, Assistant to the Biologist.

### Example No. 3.

THE best butter of this factory, after being kept for any length of time in cold storage, showed evident signs of deterioration, although up to a week or two after being manufactured it was of choicest quality.

Our investigation showed that the cream as churned was of choicest grade and had been well pasteurised. The infection that was in the cream before being heated, although large, had not had time to develop sufficiently to affect the flavour. This latent contamination was practically wiped out by the system of pasteurisation employed, as was shown by the reduction of the number of colonies in 1 c.c. of cream from 150,997,000 before pasteurising to only 500 after the heating process had been completed. After being held for nineteen hours these increased to 13,400, a striking contrast to what was experienced where a similar comparison was made in the investigations described in Examples Nos. 1 and 2. The increases in the present case were mainly due to normal increase and the multiplication of the spore-formers undestroyed in pasteurising. The small increase in the number of colonies after nineteen hours' retention of the cream in the closed-in batch-holder demonstrates the advantages of this system of pasteurisation, as far as reinfection from atmosphere and other outside influences is concerned. The cream after being heated is not exposed again, except when in the fluming while gravitating into the churn. This is an important consideration, especially where factories are situated near dusty thoroughfares.

The air exposures made in the churn room show that there was little infection present in the atmosphere. This was to be expected, as the factory in question is situated on the highlands of the Dividing Range.

### Air Exposures.

Each dish was carefully exposed for two and a half or three minutes, being carried about the room so that the plate was exposed in every part. The cold room, as is usually the case, showed the presence of moulds in some numbers; spraying or fumigating with formalin would be of benefit. Factory managers cannot keep too strict a watch on these rooms—mould is so easily carried into them by the butter boxes, the timber of which is often infected before it arrives at the factory.

It would be expected that butter made under such conditions would show a small count on being plated. The contrary, however, was experienced. An enormous increase took place (principally organisms of the coli and proteus groups), demonstrating that contamination had been effected somewhere—more than probably through decaying flesh and manure. An examination of the water showed that it was the means by which this infection was carried into the butter. The puzzling part was how to account for the types of bacteria encountered being found in a well 30 feet deep, into which the inflow of water was from the bottom. It was ascertained that drainage conditions were satisfactory, and there was no undesirable soakage of any kind. The tanks containing the water used for butter-washing purposes were too well closed in for infection to enter through them. It was ascertained on inquiry that, beside being used for washing butter, the well was drawn upon for the condenser of the refrigerator, and as this water was considerably raised in temperature in the operation, it was pumped up into a tower, some 20 or 30 feet high, and sprayed to the ground level, where it was caught in a shallow concrete tray and from there gravitated back into the well again. It was further brought to light that the overhead tanks used for holding water for the condensers were exposed to the air, and the bodies of drowned birds were at times found in them. Some distance from the factory, too, there was a pig-run. This was kept exceptionally clean, as pig-runs go, no offensive smells being apparent, but where there are animals there is bound to be excreta, and the opinion is held that it was from this source that the coli type of infection came, the germs adhering to the dust and small particles of dried manure, and being carried by the wind into the tower from which the water was sprayed; entrance could easily be gained through the louvres which formed its sides. Moreover, if any pieces of flesh fed to the pigs were not all devoured, any germs produced could be carried into the water in the same way.

The process of contaminating this water had been going on in this manner for years, until the well had become thoroughly infected.

The manager of the factory was instructed to get a better water supply for use in manufacturing butter, and was strongly recommended to sink another well some distance from the old one and to use the new supply solely for washing butter. The old well could then be set apart for the condensers, boiler, &c. This course was recommended in preference to trying to clean out the well by pumping, it being considered that the walls of the shaft would also be contaminated. It might be noted that the engine and boiler rooms of this factory formed a barrier between the pig-run and the butter and cream compartments; also, on the days our examination was made the weather was calm, which accounts, in part, for the fact that the atmosphere exposures made in the churn room were so clean.

This example serves to emphasise how easily such a perishable product as butter can be contaminated, and how infection can be obtained through most unlooked-for agencies. Who would have suspected that water drawn from a deep underground spring would be steeped in germs that are to be found on

the surface? Here again, the care and expense entailed in properly pasteurising cream were incurred only to be partially nullified by reinfecting the butter with the water used for washing it. Water used for such purposes cannot be too closely examined. During the past few months the Dairy Branch has warned several factories on this matter, as a result of bacteriological examinations carried out by the Department. The last instance is one where the water for washing the butter is drawn from a well into which water soaks from an old swamp. The company has put down shafts in different directions with the same result, and as good water is seemingly unobtainable in the vicinity of the present site, the removal of the factory to where it can be got is now under consideration. A pure water supply is an absolute essential for dairy produce factories. Those factories that have one should carefully guard it from contamination. In many cases inferior water can be greatly improved by a proper system of filtering, and even where the supply is fairly good it would be all the better for being filtered—the pipes through which it is pumped in the course of time always become, to a certain extent, dirty and this sedimentary matter should be removed.

TABLE III.—Showing Numbers and Kinds of Micro-organisms found in 1 Gram. (1 c.c.) of the following samples.

| Samples. | Total Micro-organisms. | Gelatin Liquefiers and Casein Digesters. | Acid and Acid Coagulating. | Acid and Gas Formers. | Alkaline and Inert. | Yeasts. | Oidium. | Moulds. |
|---|---|---|---|---|---|---|---|---|
| (C1) Cream before pasteurising. | 150,997,000 | 498,000 | 150,200,000 | 248,000 | 45,000 | 3,000 | 2,000 | 1,000 |
| (C2) Cream immediately after pasteurising. | 500 | 10 | 490 | .... | .... | .... | .... | .... |
| (C3) Cream immediately prior to churning. | 13,400 | 7,500 | 5,700 | .... | 200 | .... | .... | .... |
| (C4) Butter in box after packing. | 750,000 | 90,000 | 614,000 | 4,000 | 35,000 | 5,000 | .... | 2,000 |
| (C5) Butter-wash water | 11,630 | 4,160 | 1,500 | 3,500 | 1,500 | 760 | 10 | 200 |

*Sample C1—Cream before Pasteurising.*—The cream, as received in cans from the various suppliers of the factory, after being weighed and sampled for testing, was graded, and the best quality pumped into a 600-gallon pasteurising holder of the batch type. The acidity of the bulk cream, after this had been well mixed by the rotating coils of the pasteuriser, was determined at 0·48 per cent. lactic acid. A neutralising agent (lime) was added in order to reduce this acidity to the requisite percentage before pasteurisation was carried out. The sample for plating was collected from the bulk cream by means of a sterile pipette in the holding vat, after blending was completed and before the lime had been added. From the plates it was evident 1 c.c. of the cream contained 150,997,000 micro-organisms; of these, 150,000,000 were *Bact. lactis acidi*, or desirable lactic fermenters, and 200,000 were streptococci. Of the total count, 498,000 bacteria (including organisms such as *Proteus vulgaris*, *B. subtilis*, *Bact. fluorescens liquefaciens*, *Bact. fulvum*, and a micrococcus) were able to liquefy gelatin or digest casein of milk; 248,000 were organisms of the coliform group, or undesirable lactose fermenters, while of the 45,000

bacteria which cause alkalinity in litmus milk, *Bact. alcaligenes* was most numerous. Others, both spherical and rod forms, were considered inert, causing no apparent change in litmus milk or gelatin in ten days.

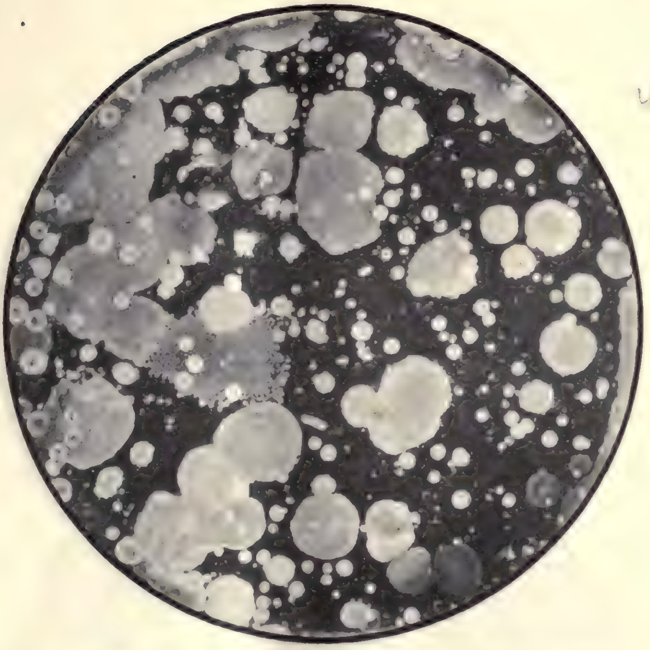
*Sample C2—Cream immediately after Pasteurising.*—The cream had been neutralised to 0·25 per cent. acidity with lime and pasteurised by means of the holding system, where the cream was raised to 145 deg. Fah., and held at that temperature for twenty minutes. The sample for plating was collected by means of a sterile pipette direct from the vat before the cooling process began. From the plates, 1 c.c. of the cream contained 500 bacteria; of these 490 were gram positive bacteria, which slowly coagulated litmus milk with production of acid, and ten of a sporing bacillus of the *B. subtilis* type.

*Sample C3—Cream immediately prior to Churning.*—The pasteurised cream was cooled to 55 deg. Fah., and allowed to remain in the pasteurising vat twenty hours (overnight). The lid of the vat was kept closed, and no "starter" was added. The sample for plating was collected by means of a sterile pipette direct from the bulk in the vat. From the plates, 1 c.c. of cream contained 13,400 bacteria. Of these, 1,900 were *Bact. lactis acidi*, or desirable lactose fermenters, 3,800 were streptococci, and 7,500 (including spore-forming organisms of the *B. subtilis* type, *Sarcinæ* and *Cladothrix* sp.) were able to liquefy gelatin. One hundred and fifty were bacteria able to produce alkalinity in milk, and fifty were chromogenic micrococci, classified as inert, having caused no apparent change in litmus milk or gelatin in ten days.

*Sample C4—Butter in the Box after Packing.*—The cream from the pasteurising and holding vat was gravitated along a fluming into the churn in another room in the factory. The cream was churned in the Simplex churn. The sample for plating was collected by means of a sterile instrument from the near surface butter as packed in the box ready for market. From the plates 1 gram of butter contained 750,000 micro-organisms. Of these, 90,000 (including varieties of the proteus group, *Bact. fluorescens*, spore-forming organisms, *Sarcinæ* and *Bact. prodigiosus*) were gelatin liquefiers, or were able to digest the casein of milk, and 614,000 were bacteria which, when inoculated into litmus milk, produced acid or caused an acid coagulum. Of these lactose fermenters, 500,000 were *Bact. lactis acidi*; 60,000 were streptococci, while the remainder of this type were varieties of micrococci, some being chromogenic. Of the 4,000 organisms of the coliform group, two members were isolated, viz., *Bact. coli communis* and *Bact. lactis aerogenes*. Of the remainder, 25,000 were bacteria able to cause milk to become alkaline; 10,000 were considered as inert, having made no apparent change in gelatin or litmus milk after ten days; 5,000 were yeasts, and the 2,000 moulds were species of *Penicillium, Fusarium,* and *Cladosporium.*

*Sample C5—Butter-wash Water.*—The source of this supply was a well about 30 feet deep. This same water was also used to flow over the condenser tower and was then allowed to flow back into the well. Samples for plating were collected into sterile vessels from the tap in the churn room and also direct from the well.

C1



**Agar Plate Culture of Cream before pasteurising (dilution 1 to 1,000).**

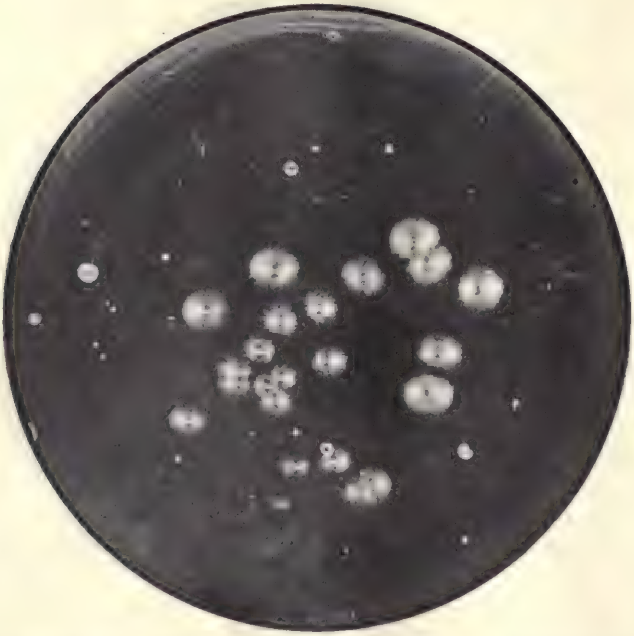
Note the amount of latent infection in this cream as delivered at the factory; largely coliform types. (Original.)

C2

**Agar Plate Culture of Cream after pasteurising by holding system, at 145 deg. Fah. (dilution 1 to 10).**

Note the great reduction in the count, from 150,997,000 micro-organisms to only 500 per c.c. The latent infection has been killed out before the development could affect the flavour of the cream or butter. (Original.)

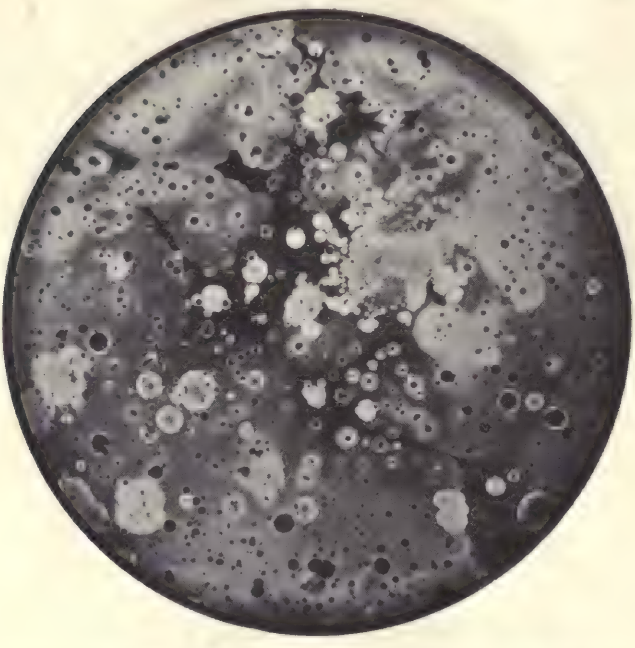
C3



**Agar Plate Culture of Cream before churning, 19 hours after pasteurising, having been held at 55 deg. Fah. (dilution 1 to 100).**

Note that there has been no reinfection from outside influences, such as the air, &c., but the count has increased to 13,400 per c.c. by multiplication of bacteria—lactics and spore-formers—which survived pasteurisation. (Original.)

C4

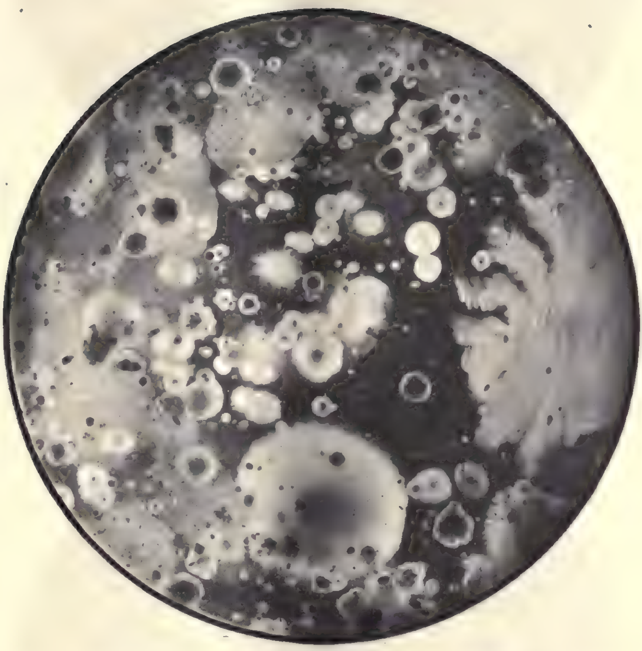


**Litmus Lactose Plate Culture from surface of butter packed ready for market (dilution 1 to 1,000).**

Note the enormous reinfection by coli and proteus organisms.
Total count, 750,000 per c.c. (Original.)

487

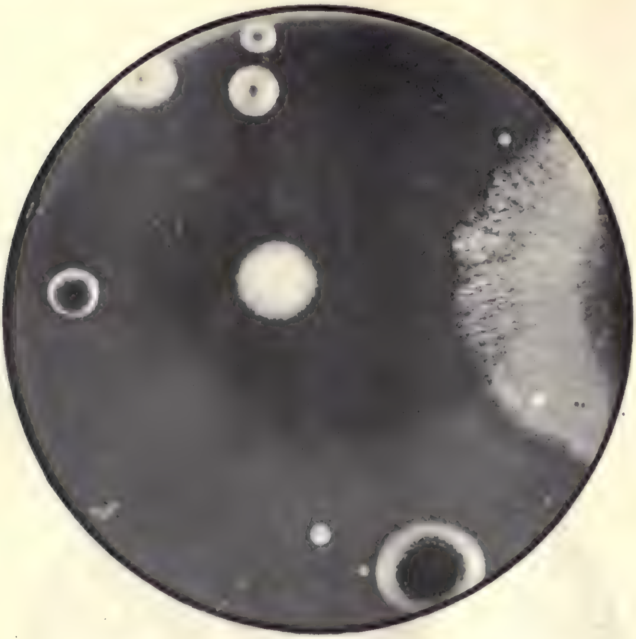
C5



**Litmus Lactose Agar Plate, 1 c.c. of well water used for washing butter.**

Note the large number of colonies, coli, proteus, and moulds, corresponding with infection found in butter. Total count 11,630 per c.c. (Original.)

C6



**Agar Plate of air exposure for 2½ minutes in the cold room at chilling temperature.**

Note the slight infection by moulds, &c. (Original.)

C7

**Agar Plate of air exposure for 2½ minutes in the churn room.**

Note the purity of the air, the locality being an elevated one. (Original.)

The total micro-organisms in 1 c.c. was 11,630. Of these 4,160 were able to liquefy gelatin. They included varieties of the proteus group, *Bact. fulvum* and *Sarcinae*, *Bact. fluorescens*, *Bact. prodigiosus*, and several varieties of spore-forming organisms. (Anaerobic spore forms were detected in dilutions of 1 to 100.) Of bacteria able to cause an acid coagulum when inoculated into milk, 1,500 were detected. These included a streptococcus and chromogenic micrococci. Undesirable lactose fermenters numbered 3,500. Of the remaining bacteria, 500 were classified as inert, while 1,000 were able to render litmus milk alkaline, and 760 were varieties of yeast. Oidium lactis was also isolated. The 200 mould growths were species of *Cladosporium* and *Aspergillus*.

## Grow Your Own Vegetables.

Have you a patch of land that is capable of being cultivated? If you have, it should not be idle. Patriotism and the soundest domestic economy demand that you should raise vegetables on it. The "thrift plot" is a necessity of the day—a telling weapon with which to combat the high cost of eating.

Every kind of food material is dear, and many kinds are scarce and not likely to be in good supply for some time. Increased production is the only solution of the problem of high prices. Vegetable-growing will reduce the outlay on food, and can be made to do so almost at once. Nine-tenths of the households of this State have a plot of ground large enough to raise a substantial quantity of fresh vegetables—almost sufficient for the family requirements if well managed.

A pamphlet by Mr. A. J. Pinn, Inspector of Agriculture, entitled "Grow Your Own Vegetables," tells how a start may be made at once without waiting for the spring. Copies are obtainable free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

## Good Returns from Table Grapes.

The statement that gross returns of up to £400 per acre had been obtained from grapes in the Griffith district, Murrumbidgee Irrigation Area, drew from another Griffith settler a request for verification, with the remark that "the figures are most encouraging, and look as if we settlers could look forward to comfortable incomes from our blocks when in full bearing."

In giving the name of the fortunate grower, Mr. H. E. Laffer remarked that another grower in the same district claimed even greater returns. Admittedly table grapes are excellent property just now, for those who have them in bearing, but it is to be feared that any great extension of areas due to the high prices, will, in the course of a few years, result in a slump. Under the circumstances Mr. Laffer would not advise additional plantings of table grapes.

# Faults found in Butter.

## Their Definitions, Causes, and Some Suggested Remedies for Same.*

A. M. BROWN, Dairy Instructor and Grader.

It is my desire in this paper to endeavour to give some explanation in detail of the remarks of the grader in connection with the flavour of butter which appear in condensed form on the grade slips and check grading forms which are sent out to the factories by the Dairy Branch, and which are intended to convey to managers and butter-makers information as to the faults or general quality of the butter produced at their factories. I desire also to suggest remedies for some of the faults found.

### "Tallowy."

A remark very often recorded is "tallowy." This means that the butter has assumed to a greater or less degree the flavour of tallow or lard, and is losing, or has entirely lost, its characteristic butter flavour. This fault is caused by a chemical change, or the action of certain bacteria on the fat, either in the cream before its manufacture into butter or in the butter after manufacture.

Butter that has been "heated" in any way, or subjected to any extra amount of friction in the process of manufacture, either through being over-churned, over-worked, or rammed too much in the process of packing, will tend to be tallowy in flavour.

Cream that is stale and that contains a high percentage of fat, if held at a comparatively high temperature under unclean conditions, will become tallowy and produce tallowy butter, probably through its being infected with certain organisms whose action on the fat has the effect of splitting it up and liberating some of the volatile oils which give butter its characteristic flavour.

Cream that has been carted long distances and exposed to the direct rays of the sun, or that has been held in rusty cans, will often assume a tallowy flavour and produce tallowy butter.

Tallowy cream should always be graded second grade or lower, according to the degree to which this objectionable flavour has developed, and should on no account be mixed with untainted cream, for, as the fat itself is being practically decomposed, the admittedly beneficial effect of the process of pasteurisation on certain other inferior creams cannot be expected to apply to cream the main solid constituent of which is undergoing such a complete chemical change.

* Paper read at Co-operative Dairy Factory Managers' Conference, Sydney, 24th June, 1920.

### "Unclean."

The remark "unclean" may be understood to mean that the butter concerned has a dirty taste, and not the clean flavour associated with good butter. This common fault is caused in quite a number of ways, probably the most common of which is by the milk or cream from which the butter is made coming in contact with and being contaminated by something foul or unclean, such as a dirty separator, dirty cans, dirty utensils, &c.

The dirty hands of the milker are a common source of contamination, as is also the body of the cow herself, by particles of filth falling into the milk during the process of milking and there setting up an undesirable fermentation. The mixing of the milk from newly-calved cows, "strippers," or from cows suffering from disease or any undue excitement with that of the remainder of the herd also causes contamination owing to the large percentage of albumen usually present in such milk quickly decomposing. This decomposition is a frequent cause of unclean flavour in butter.

The absorption by milk or cream of a foul odour from some dirty or insanitary place may be the direct cause of this trouble, and the butter made from it be described as unclean in flavour. Cream badly affected in this way should be graded second grade or lower.

Care on the farm and strict attention to the smallest detail in the general cleaning at the factory, if practised conjointly with the help of the pasteuriser, should do away with unclean flavours in butter. I mention the word conjointly advisedly, because I am convinced that, although the pasteuriser may be regarded in some quarters as a "cure all" for faults found in butter and cream, it is not so, for it cannot improve a thoroughly unclean cream to such an extent as produce an untainted or clean flavoured butter The combined help of the farmer on the one hand and of the factory manager on the other is therefore required, so that the machine may have as clean a cream as possible to treat and be given every chance to do its work well. When these important factors are thoroughly combined, the word "unclean" in connection with the flavour of butter will be a thing of the past.

*Absorbed Flavours and Aromas.*—There are certain flavours and aromas that milk, cream, and butter absorb, such as that of paint, disinfectants, oil engine fumes, apples, &c., which, although not what might be classed as actually unclean in the same sense as those caused by the other contaminations mentioned, still give to butter a flavour and aroma that is foreign to the good article, and which therefore may be included under the main heading "unclean." When flavours such as these are noted by the grader, it is the custom to specify on the grade slip or check grading form what particular foreign flavour they resemble. Neutralisation and pasteurisation do not wholly eradicate these flavours from cream.

*Unclean After-flavour.*—This means that the butter has an unclean flavour which is not at once detected on first being tasted, but is only noticed after the fat has melted considerably on the palate. This fault is really a partially developed form of the unclean flavour already mentioned, and usually becomes more pronounced as the butter becomes older. The remarks with regard to the cause and remedy for unclean flavours apply to this fault also.

### "Fishy."

The term "fishy" means that the butter has a disagreeable flavour like fish oil. True fishiness is rarely found in comparatively fresh butter, but a peculiar "oily" flavour, which has been proved to be the first indication of fishiness, is more often noted, though not nearly as frequently as was the case some few years back.

Fishiness is said to be associated with butter made from old acid cream, and this statement has been borne out by the result of investigations carried on by the New South Wales and New Zealand Departments of Agriculture.

The mould *Oidium lactis* is also said to play an important part in the production of this flavour in Australian butter, but what particular germ or combination of germs is actually the cause of the trouble is, I am afraid, a conjecture, for some differences of opinion appear to exist amongst experts in this connection.

However, whatever may be the direct cause of fishiness, there seems to be little doubt that in the process of neutralisation and pasteurisation of cream properly carried out a means has been discovered whereby this trouble can be eradicated. The Department's experience of the 1916 winter storage butter helps to prove this, for at that time two consignments of butter were sent to Sydney by a large factory to be stored for winter use, one lot being pasteurised and the other not. These consignments were put into cold store in March and examined between four and five months afterwards. It was then found that the unpasteurised butter had become "fishy" and the pasteurised consignment showed no sign of this flavour. In this connection, it is also a significant fact that, out of the winter pool butter of 1918 examined by me on its release from cold store, only a comparatively few lots came out "fishy," and these latter consisted almost entirely of butter from factories which did not carry on the process of neutralisation and pasteurisation.

*Pasteurised butter with indications of fishiness.*—There were also certain lots of the butter in the 1918 pool which came from factories where pasteurisation was carried on, but which on examination showed signs of fishy development; but this fact, to my mind, in no way prejudices the claim that pasteurisation is an efficient preventive for fishiness in butter, for I contend that this state of things may have been brought about by the adoption of incorrect methods in pasteurisation—such as, in the case of the flash system, not heating as nearly as possible the whole bulk of the cream to a sufficiently high temperature, and, in the batch system, not holding the cream long enough at the temperature to which it had been heated to destroy the particular organisms which cause this flavour.

In the case of the latter system an example may be quoted of how a little oversight may also cause contamination, and possibly result in the production of this flavour. It had been noticed that the quality of the butter made from the first churn out of a particular lot of cream which had been pasteurised by the holding system was inferior to that made from the remaining cream in the

same vat. When subsequently investigating the cause of this, it was found when a bacteriological plate was made from a sample taken from the first few gallons of cream as it left the machine, that the species of undesirable bacteria found in the cream before pasteurisation had started were present in undiminished numbers. Further bacteriological plates made from samples of the remainder of this lot of cream after pasteurisation showed freedom from these bacteria; and on further investigation being made, it was found that the cream (about 1 gallon) which had lodged in the outlet pipe of the machine had not been sufficiently pasteurised through not having come in contact with the heating coil of piping, while the cream in the body of the vat had been heated and kept at the required temperature for the stipulated period. The greatest care should be taken to ensure that the cream which has lodged in the outlet pipe of the machine is removed and mixed with the heated cream in the vat, when the temperature of the bulk is well over 140 degrees.

Again, the cream may have been properly pasteurised, but been contaminated after leaving the pasteuriser. To obviate this trouble, care should be taken when using the flash system to heat as nearly as possible the whole bulk of cream to the required temperature of 180 degrees to 185 degrees. To enable this to be done the Department recommends the use of a movable pipe attachment to the outlet pipe of the machine, so that any cream which the thermometer shows has not been heated to the required temperature when the pasteuriser is first started can be run direct into some receptacle and afterwards returned to the main bulk of cream to be treated.

With the batch system, care should be taken that the cream, when it has been heated to 145 degrees to 150 degrees, is held at that temperature for twenty minutes to half an hour before cooling is commenced. If this is not done the main object of using low temperatures in the heating to destroy the bacteria is defeated, for comparatively few undesirable organisms are killed at these low temperatures unless held there for some time.

Again, as before stated, even when the methods of pasteurisation have been correctly carried out, the cream may have been contaminated after being heated, by dirty pipes, coolers, vats, churns, &c., and the fishy flavour in the butter produced in this manner. Admitting that pasteurisation and neutralisation of cream is an undoubted remedy for fishiness in butter, it cannot be contended that the fact relieves the farmer of his responsibility to supply a clean untainted cream to the factory; nor should it make the factory manager any the less careful in keeping clean everything that the cream touches, for, although fishiness in butter may be eradicated by careful pasteurisation, there are other infections in cream caused by contact with dirt which are just as injurious to the butter made from such cream, and which are not eliminated by this process. Therefore it behoves everyone connected with the factory, be he supplier or employee, to make cleanliness the first principle underlying all he does, either in connection with the production of cream on the farm or in the process of its manufacture into butter at the factory.

### "Rancid."

The term "rancid" is one which it is not very often found necessary to use, except in connection with some low second or third grade butters or with very stale old butter, although it is sometimes noticed in a mild form in fresh butter. It produces a very strong and unpleasant aroma by which the trouble can be at once identified.

Strange to say, I have come across this fault on a few occasions in a number of fresh butters, the brands concerned being rather well-known ones. In one instance which I have in mind, the centre of a box of butter tasted very cooked, the flavour being very similar to that of condensed milk, but the extreme outside surface smelt and tasted extremely rancid. Whether or not the over-heating of the fat in the process of pasteurisation had rendered it more susceptible to the "access of air, warmth, and the presence of various micro-organisms," which Percival, the English bacteriologist, quotes as three of the seven "conditions which govern and accelerate rancidity," cannot be determined with certainty, but the distinct rancid flavour only being apparent on the extreme outside surface, and not in the interior of the box of butter, leads one to believe that such was the case in this instance. It certainly helps to prove that rancidity, when developed after the butter is made, works from the outside surface inwards.

As I have also come across cream which I have known to be fresh and apparently containing very little acid and yet tasting distinctly rancid, and have traced the cause without a shadow of a doubt to a deep-seated, filthy contamination, I am convinced that bacterial contamination through filth is one of the main causes of this fault, for cream such as this would certainly make rancid butter.

Both Percival and Conn agree that *Fluorescens liquefaciens* and certain species of bacteria which cause butyric acid fermentation play a part in the production of this flavour in butter. The former organism being associated with bad water, and having a putrefactive action on certain constituents of butter and cream, it behoves both the farmer and the factory manager to see that the water supply at the farm and the factory is an unpolluted one, especially as this germ is often found to be present in other inferior butter beside the one mentioned.

(*To be continued.*)

## Colouring in Black Orpingtons.

Answering recent inquiries with regard to colour faults in Black Orpingtons, the Poultry Expert stated that it is a feature of almost all strains to show some purple colour. This does not mean impurity, but is a fault from a standard point of view; beetle green is the right colour. Red in the hackle is so serious a fault as to cause a bird to be rejected as a breeder, while pink legs and feet, instead of black ones with white toe-nails, is also serious, being possibly due to foreign blood. The standard requirement for eye colour is dark brown iris.

# Soil Improvement for Maize.

## I.—Manures and Fertilisers.

[Continued from page 324.]

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

### Experience with Fertilisers for Maize in New South Wales.

Experiments with fertilisers for maize (both for grain and fodder) have been carried out in nearly all the maize districts of the State for many years, and as these tests have been made on farmers' experiment plots under typical farming conditions, their value will be readily admitted. It is realised that in testing fertilisers somewhat different results may be obtained according to the season, and this fact, in addition to the impracticability of eliminating experimental error on these plots, leads us to recommend that farmers should be advised by the average of collective results over several seasons as presented here rather than by individual results obtained even on their own farms.

Owing to the absence of potash fertilisers during the last few years and the different form (and increased price) of this fertiliser now on the market, further tests will have to be carried out before any recommendations can be made regarding potash for maize. While the Department is in a position to recommend strongly different fertilisers or mixtures (according to the district) as being highly profitable for maize on the results to date, further success is hoped for, and it is essential that these tests should be continued. The most important conclusion which can be presented is that there is a significant difference in the kind and amount of fertiliser which has given best results in the different districts of the State. It is likely, too, when further data has been collected, that some similar conclusion will be reached in regard to the different soils in each district, but this is not possible just now owing to the absence of a definite classification of the soils on which the experiments have been conducted and owing also to the number of tests on each class of soil necessary to a reliable average result being still incomplete. There is, however, sufficient evidence to conclude that even in the same district the fertiliser which gives the best results for grain may not always be the most profitable for fodder. The results will therefore be given separately for grain and for fodder, and the division of the State into districts for the fertilisers recommended will not be more than a rough classification, dependent mostly on length of growing season.

### Fertilisers for Grain.

*Coastal Districts.*

Reference has already been made to the results obtained from the use of soluble nitrogenous fertilisers like nitrate of soda and sulphate of ammonia. It has been fairly conclusively proved that on the coast it is not only unprofitable but harmful to apply any of these fertilisers to a maize crop for grain.

The addition of either of these fertilisers has resulted in an average diminished yield of two or three bushels per acre. Even were an increased yield obtained from their use it is doubtful whether it would be profitable owing to the high cost of the element nitrogen in fertilisers, and owing to the comparatively cheap and easy method of supplying the soil with nitrogen from the air by leguminous crops as explained in previous articles. Some idea of the amount of fertiliser to apply will be given by the following results of tests carried out with different quantities of superphosphate on the coast:—

| | 2 cwt. Superphosphate per acre. | | 3 cwt. Superphosphate per acre. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Average of four tests ... | 66 | 51 | 64 | 13 |

There seems to be no advantage, therefore, in a dressing of more than 2 cwt. of superphosphate per acre for maize on the coast. From the figures previously given it will be seen that 2 cwt. of superphosphate per acre will supply about as much phosphorus as is required for a 50-bushel crop, and it is reasonable to suppose that for heavier crops the balance of this element can be easily supplied by the fertility existing in the alluvial soils on which these tests are mostly conducted. The following results, however, definitely show the superiority of 2 cwt. superphosphate per acre over 1 cwt. per acre:—

| | 1 cwt. Superphosphate per acre. | | 2 cwt. Superphosphate per acre. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Average of forty-two tests | 55 | 55 | 59 | 36 |

This means an increase of nearly four bushels of maize (at an additional cost of 5s. 6d. per acre) for the extra cwt. of superphosphate—a profitable transaction. There is some indication, however, that on soils where heavy yields of maize cannot be expected, it does not pay to use heavy dressings of artificial fertilisers. The following results, obtained on the coast from plots where the yield was less than 40 bushels per acre, are in favour of the application of 1 cwt. superphosphate per acre on these soils:—

| | 1 cwt. Superphosphate per acre. | | 2 cwt. Superphosphate per acre. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Average of five tests, on soils yielding less than 40 bushels per acre... | 37 | 1 | 35 | 31 |

Further results confirmatory of this theory will be awaited with interest, as the number of tests so far made is insufficient to definitely establish it. There appears, however, to be some ground for this opinion, for still smaller quantities of fertiliser give the most profitable results on the tablelands, where the average yields are about 25 bushels per acre. In any case the gross returns from maize are not sufficiently great to justify expensive quantities of fertiliser such as are profitable with potatoes and market-garden crops.

Of all the fertiliser mixtures tried on the coast in the Department's experiments, none has given such large and profitable increases in the maize crop for grain as 2 cwt. per acre of the mixture known departmentally

as P7; this consists of equal parts of superphosphate and bonedust. It had given good results in maize in South Africa, and was suggested by Professor Watt (Chair of Agriculture, University of Sydney), to the writer who, in turn, suggested its trial to the Department. In comparison with superphosphate, its superiority was at once seen, and that it has been maintained will be seen from the following averages, extending over several years:—

| | 2 cwt. P7 per acre. | | 2 cwt. Superphosphate per acre. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Average of thirty-two tests | 58 | 19 | 56 | 46 |

This superiority of P7 over superphosphate shows up more on the South Coast and on the North Coast tablelands (Dorrigo and Comboyne), where an average increase of 3½ bushels per acre is recorded in favour of P7.

Reference has previously been made to potash as a fertiliser for maize. Although some increases are recorded from sulphate of potash, it was stated that owing to the high prices for potash fertilisers, and to the fact that farmers can render themselves independent of the need for supplying potash by maintaining the supply of organic matter, no application of potash fertilisers was advisable for the maize crop for grain, except in those instances where experiments have shown their need and the profitableness of their application under these conditions. That we have in P7 an efficient and profitable fertiliser for maize for grain on the coast without rushing after potash fertiliser at the present time will be seen from the following comparison with P5 mixture—the only mixture containing potash which has been tried on maize in New South Wales. These mixtures are about equivalent in price at the present time (1920):—

| | 2 cwt. P7 per acre. | | 1¼ cwt. P5 per acre. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Average of twelve tests ... | 66 | 1 | 62 | 29 |

Finally, the profitableness of the Department's recommendation for maize on the coast will be seen from the following:—

| | No manure. | | 2 cwt. P7 per acre. | |
|---|---|---|---|---|
| | bus. | lb. | bus. | lb. |
| Average of thirty-seven tests | 52 | 28 | 61 | 16 |

At a cost of 15s. per acre, P7 mixture has given an increase of nearly 9 bushels per acre (with an average value of 36s.); thus showing a profit of 21s. per acre. On the North Coast tablelands (Dorrigo and Comboyne) the average increase per acre has been 13½ bushels.

No maize grower on the coast can afford to ignore this method of increasing the profits from his maize crop. In addition to increased and highly profitable yields from P7 mixture during the season of application, there is little doubt that this mixture (containing bonedust) will have more residual value than most other fertilisers. The best results have been obtained from it in seasons of good rainfall, and if the results do not come up to expectation in

a dry season, one may be sure that little or none of the fertiliser will be lost from the soil, and that the residual effect will help to swell the yield in the following season.

*Northern Tableland.*

An instance of how the fertiliser requirements for maize on the Northern Tableland differ from those of the coast may be seen from the results obtained from P7 mixture. Here (on the Northern Tableland) compared with those from superphosphate, the yields from P7 have fallen short by 3 bushels per acre, each fertiliser being applied at the rate of 1 cwt per acre. As regards potash, the tests made so far indicate that the fertiliser is not required for maize on the tableland soils, an average decrease of 1 to 3 bushels being obtained from the addition of 14 to 28 lb. sulphate of potash to superphosphate. There is, however, something to be said in favour of soluble nitrogenous fertilisers like nitrate of soda or sulphate of ammonia. In these cold districts, the conversion of nitrogen compounds into nitrates which can be used by plants is much slower than on the coast, and soluble nitrogenous fertilisers supply this lack in early spring with some benefit.

An average increase of 4½ bushels per acre has been obtained by the addition of 56 lb. sulphate of ammonia to superphosphate—an increased production valued at 18s., at a cost of 13s. per acre for fertiliser, representing a profit of 5s. per acre from its use. There is no reason why nitrate of soda should not give a similar profit here.

Tests made to compare the comparative values of 1 cwt. superphosphate and 2 cwt. superphosphate on the tablelands, do not show any further increase in yield from the larger quantity. The following average results were obtained from 56 lb. superphosphate as compared with 1 cwt. per acre:—

| No Fertiliser. | | 56 lb. Superphosphate per acre. | | 112 lb. Superphosphate per acre. | |
|---|---|---|---|---|---|
| bus. | lb. | bus. | lb. | bus. | lb. |
| 21 | 55 | 26 | 38 | 26 | 54 |

On these figures, 56 lb. superphosphate is the most profitable application, and shows a profit of about 16s. per acre. These results are borne out by experiments in Rhodesia,* where, on light volcanic soils, in a climate similar to our Northern Tableland, 1 cwt. mixed fertiliser was found to give better yields of maize, and a greater profit per acre, than 1½ or 2 cwt.

From the foregoing it therefore appears that a fertiliser mixture consisting of equal parts of superphosphate and sulphate of ammonia or nitrate of soda, at a cost of about 16s. per acre, may be expected to give an increased yield of 8 or 9 bushels per acre. Owing to the tendency of soluble nitrogenous fertilisers to delay the maturity of the crop, and of superphosphate applied alone to hasten it, it is recommended that 56 lb. superphosphate alone be used per acre when the crop is sown later than usual, or when a somewhat late or risky variety for this district is planted.

There is need for further experiments with fertilisers containing nitrogen to be carried out on the tablelands.

* *Rhodesia Agri. Jour.*, Aug., 1916.

*North-west Slopes.*

On the North-west Slopes, particularly in the Inverell district, the comparative failure of fertilisers with wheat is well known, and it is not surprising that they have not given any substantial increases in the maize crop. An average decrease of $2\frac{1}{2}$ bushels of maize per acre has been obtained by the application of 2 cwt. superphosphate, compared with 1 cwt. of this fertiliser. The addition of potash to superphosphate has also decreased the yields. Not much hope can be given for easily soluble nitrogenous fertilisers here owing to the high summer temperatures and low atmospheric humidity.

An average increase of $2\frac{1}{2}$ bushels per acre has been obtained by the application of 1 cwt. superphosphate per acre, and until further tests are made this quantity is recommended for this district.

*Tumut District.*

There is a general impression that fertilisers are not required for maize on the rich land in this district; but, although the number of tests made so far is small, there is an indication that despite the fertility of the alluvial soils, not only superphosphate but also some easily soluble nitrogenous fertiliser, may be used with profit. Averaging the few tests made to date, there has been a substantial increase of 4 bushels per acre from 2 cwt. superphosphate as compared with the unmanured plots, although only 3 bushels increase has been made from the application of the same quantity of P7. The addition of 56 lb. sulphate of ammonia (for which nitrate of soda could probably be substituted) to superphosphate has given an increase of 6 bushels per acre, thus showing a profit of about 10s. per acre.

According to the trials made so far then, a fertiliser mixture consisting of 1 to 2 cwt. superphosphate and about $\frac{1}{2}$ cwt. sulphate of ammonia or nitrate of soda can be recommended for this district.

## Fertilisers for Fodder.

*North Coast.*

As already stated, the manuring of maize for fodder is an entirely different proposition to that of maize for grain; this fact is illustrated in the results given hereunder. The results obtained with fertilisers may also be taken as applying also to such other summer fodder crops as sorghum, Sudan grass, and millet until experiments with these have given reason for divergence from this opinion.

In comparing different quantities of superphosphate, the following results have been obtained:—

| | 1 cwt. Superphosphate per acre. | 2 cwt. Superphosphate per acre. |
|---|---|---|
| | tons cwt. | tons cwt. |
| Average of six tests ... | 14 19 | 17 3 |

Estimating the value of the green fodder at 15s. per ton, the extra 1 cwt. of superphosphate has returned a profit of 27s. 6d. per acre. The addition of 28 lb. sulphate of potash to superphosphate has given an average increase of nearly $1\frac{1}{2}$ tons of green fodder, and therefore seems profitable,

though not highly so, on account of the present high cost of potash fertilisers. There has been an average increase, however, of about 3½ tons per acre from the addition of 56 lb. sulphate of ammonia to superphosphate, giving a net profit of 41s. per acre for this fertiliser. Similar results could no doubt be obtained from nitrate of soda in addition to the superphosphate.

The following figures show the net profit from an application of 2 cwt. superphosphate per acre :—

| | No fertiliser. | | 2 cwt. Superphosphate per acre. | |
|---|---|---|---|---|
| | tons | cwt. | tons | cwt. |
| Average of six tests... ... | 12 | 17 | 17 | 3 |

Thus an average increase of 4 tons 6 cwt. of green fodder per acre has been obtained, giving a profit of over 50s. per acre. From these figures it is recommended that a mixture consisting of 2 cwt. superphosphate and 56 lb. sulphate of ammonia or nitrate of soda be used for maize or other summer fodder on the North Coast, except where a leguminous crop like cow peas or field peas have been ploughed in for green manure, in which case the superphosphate can be used alone.

### *South Coast.*

On the South Coast 1 cwt. of superphosphate has given approximately the same average increase of green fodder per acre as 2 cwt., so that the smaller amount may be recommended as the most profitable here. P7 mixture has given about the same profit per acre as 1 cwt. of superphosphate, but the number of tests made are not yet sufficient to give definite conclusions.

The addition of either sulphate of potash or sulphate of ammonia to the superphosphate has in an average of thirteen tests not increased the yield of fodder at all, so that neither of these fertilisers can be recommended. The results obtained from 1 cwt. superphosphate per acre are as follows :—

| | No fertiliser. | | 1 cwt. Superphosphate per acre. | |
|---|---|---|---|---|
| | tons | cwt. | tons | cwt. |
| Average of thirteen tests ... | 8 | 3 | 10 | 11 |

These figures show a profit of about 30s. per acre for 1 cwt. superphosphate, and this fertiliser may therefore be confidently recommended for maize or other summer fodders on South Coast soils.

### *Southern Tableland.*

On the Southern Tableland superphosphate again stands out as the most profitable fertiliser from the trials made to date. An average increase of 12 cwt. green fodder per acre has been obtained from the application of 2 cwt. superphosphate per acre over that of 1 cwt. per acre, thus making the larger quantity slightly more profitable here. P7 mixture has given encouraging results from two trials, but it is felt that these are not yet sufficient to recommend it. Although the respective additions of sulphate of potash and sulphate of ammonia to superphosphate have given slight increases in the yield of green fodder, the applications have not been

profitable and they cannot be recommended yet. It might have been expected that some easily soluble nitrogenous fertiliser, like sulphate of ammonia or nitrate of soda, would give profitable returns on some of the Southern Tableland and South Coast soils in view of the increases obtained on the North Coast, and further trials on summer fodders with these fertilisers are desirable. The average increase obtained on the Southern Tableland from 2 cwt. superphosphate per acre is as follows:—

| | No fertiliser. | 2 cwt. Superphosphate per acre. |
|---|---|---|
| | tons cwt. | tons cwt. |
| Average of six tests ... | 6 6 | 10 9 |

This gives an increase of 4 tons 3 cwt. per acre from 2 cwt. superphosphate, thus showing a profit of over 50s. per acre for its application in this district.

Further articles on soil improvement for maize will deal with green manures, cover crops and rotations.

(*To be continued.*)

## Pisé Buildings.

In reply to the inquiry of a recent correspondent as to the merits of pisé, the Works Overseer of the Department stated that it is a suitable material for the erection of all one-storied buildings, and that some very comfortable homes have been made of it. Sometimes the walls are made of pisé alone, when they should be from 12 inches to 18 inches thick; but if studs and a casing of heavy wire netting are used, 6 inches is sufficient, though in this latter case there is a possible danger of white ants. Externally it may be plastered with cement, and internally with lime-plaster, as for brickwork. One skilled builder (who should be selected by calling for tenders) is required; labourers can do the remainder of the work under his supervision. Pisé building is of course limited to country districts. Both bricks and timber are cheaper there than in the city, but, speaking generally, the cost of the walls is about 25 per cent. less than either weatherboard or brick.

## The Backing Needed by Farmers.

So long as the farmer must contend in his business with the elements of chance, he must be supported by the confidence that back of him is his banker, ready and able and willing to come to his aid in time of drought, flood, storm, insect visitation, or other misfortune.

Help from the banker in such times of stress is seldom particularly hazardous for the banker. Droughts may come in two or more successive years, and army worms may follow a cyclone, but the land will always be there and continue to produce. There is no greater certainty of permanency or ultimate return in any industry. This is a point that should be more generally appreciated by bankers.—E. T. Meredith, U.S. Secretary of Agriculture.

# Thrips Damaging Tobacco

(*Anaphothrips striatus* OSBOURNE).

W. W. FROGGATT, F.L.S., Government Entomologist.

THE importance of the study of insect pests infesting tobacco in Australia has been emphasised by the damage sustained by the tobacco crop in the Tamworth and Gunnedah districts this season. The appearance of countless numbers of thrips upon the maturing leaves, causing them to dry, resulted in a considerable reduction in the weight of the infested foliage.

Thrips are minute insects with pointed, cone-shaped mouths, with which they cut the surface of the leaf and suck up the sap, causing the foliage to become mottled and discoloured before it has matured. These insects, which develop very rapidly, lay large numbers of microscopic semi-transparent eggs, usually along the midrib of the leaf. The larval thrips, almost pure white, but tinged with green or yellow, follow the veination of the leaf, where the sap is most abundant, and as they increase in size and numbers finally scatter all over the surface. While feeding they exude a globule of watery matter and this excrement forms a deposit of dirty specs all over the surface of the infested leaves. These specs, in the case of tobacco, also damage the quality of the dried leaf.

It is rather remarkable that, though tobacco grown in the United States and Cuba is subject to the attacks of many injurious insects, the writer can find no record of thrips among them. It is true that one species common in the United States is known under the scientific name of *Thrips tabaci*, but it received this specific name from Professor Lindeman, who, when describing it, recorded this thrips as a serious tobacco pest in Bessarabia.

The thrips now found upon tobacco may have been in the Tamworth and Gunnedah districts for some years, and even upon the tobacco plants in small numbers; yet it is evident that climatic conditions have caused them to turn their attention to these plants, which, grown under irrigation, are the only green crops in the district. All the grass and herbage upon which they might have previously existed have been dried or eaten off under the drought conditions that have prevailed during the last two years.

Among the cosmopolitan species of thrips that have been identified and recorded from Australia are two somewhat similar species, that, to the casual observer, might have been determined as our tobacco thrips. The first is *Thrips tabaci*, Linden, which the writer has identified on onions in the Botanic Gardens, Sydney, at Gosford, and in several other localities. This is the species that did so much damage to roses in the suburban gardens of Sydney some years ago; it was then popularly known as the "rose thrips." It is somewhat remarkable that the opening buds of the light-coloured (yellow and white) roses suffered much more than those of the dark

red and pink blooms. Mr. Dudley Moulton of the United States Bureau of Entomology, who examined the writer's specimens, proved, however, that the thrips infesting the roses in the Melbourne gardens was not the same species as that affecting those in Sydney, but was closely related, if not identical, to *Euthrips nervosus*, a thrips found breeding upon corn and various grasses in America.

The second species was long known in America as *Thrips tritici*, Fitch, but was placed in the genus *Frankliniella* by the Austrian Entomologist, Professor Karny, in his system of classification published in 1910. This is the wheat thrips of the United States; it has a very wide range there, and also infests many flowering shrubs and plants both wild and cultivated. It frequently does a great deal of damage to strawberry plants in Florida and Illinois by puncturing the flowers and thus interfering with fertilization. The damage thus caused is locally known as "buttoning."

From their small size thrips are easily overlooked, and the harm caused by them is often ascribed to fungus, mould, rust and other causes.

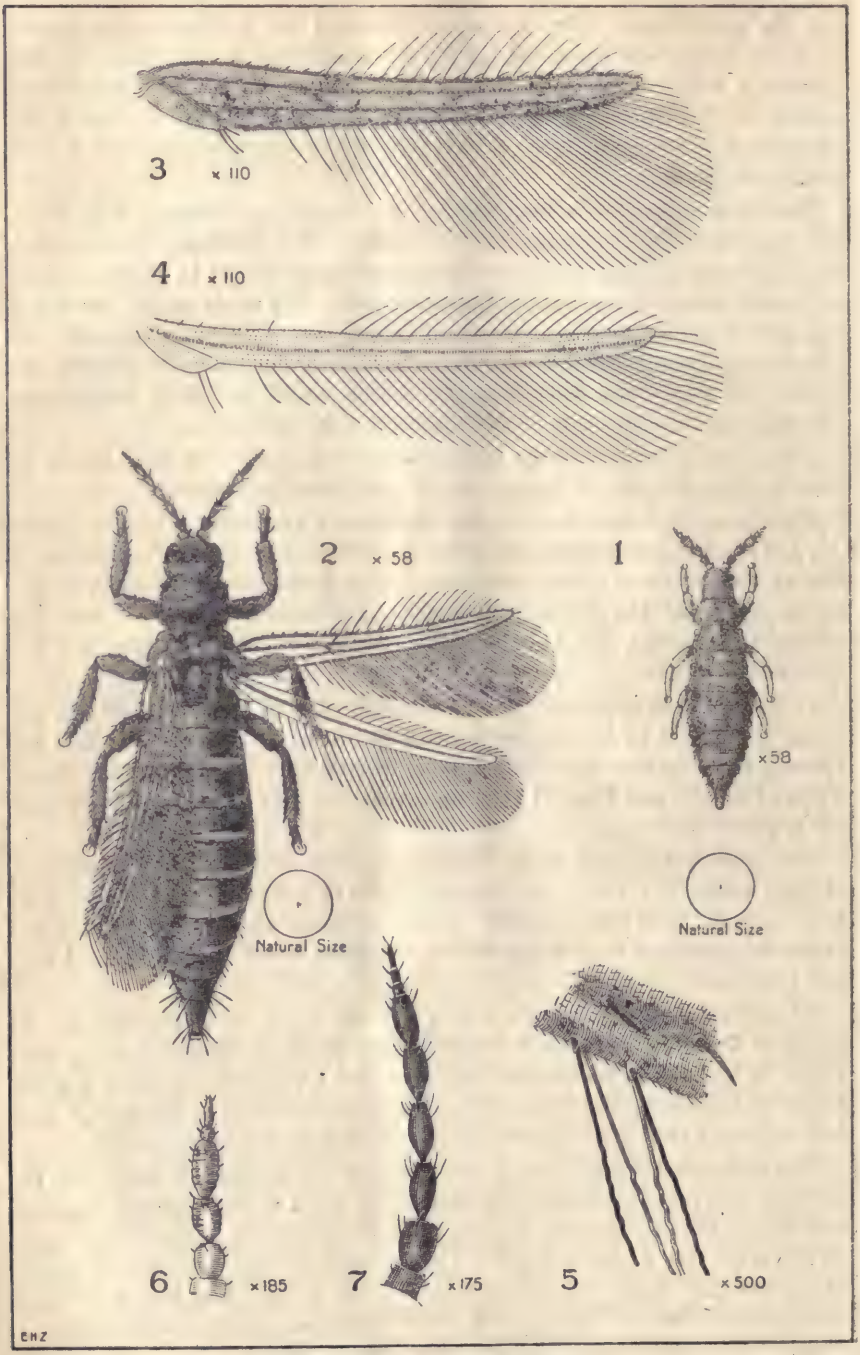
French, in his "Handbook of the Destructive Insects of Victoria" (Part V., 1911) gives an illustrated account of a common thrips doubtfully identified as *Thrips tabaci*; this, he states, did a great deal of damage to the potato crops of the Lancefield district, and also swarmed all over the adjacent pea crops, the hawthorn and African boxthorn hedges, and the surrounding grass.

In 1913–14 the apple crop of the costal districts of New South Wales was seriously reduced by the enormous numbers of thrips that swarmed into the opening blossoms and caused the flowers to drop off. Gurney ("Some Insect Pests of Apples and Pears") gave an account of this thrips in this journal, 1915, pp. 303.

The grass thrips has never been previously recorded from Australia, though, owing to its small size and its habits of infesting grass, it may have been casually introduced many years ago from the United States and remained unnoticed until it turned its attention to an important field crop like tobacco.

At the time of the writer's visit (on 25th April last) specimens in all stages of development, from freshly hatched larvæ to winged insects, were found in large numbers on both the upper and under surfaces of the tobacco leaves at Gunnedah and Tamworth. From the condition of the foliage they had evidently been feeding upon the plant for some weeks previously.

The larval thrips are white with reddish eyes; the head is small, and the antennæ short and thickened, standing out in front of the head and composed of seven joints, of which the last four are closely joined together and might be mistaken for a single joint. The legs are stout, bearing the typical bladder-shaped, single segment or foot, and two claws. The body is fusiform, rounded, tapering to the tip, which terminates in a short, tubular process; the tenth segment bears six long hairs (*setæ*). Under a high magnification, the segments of the abdomen show a very curious transverse striation,

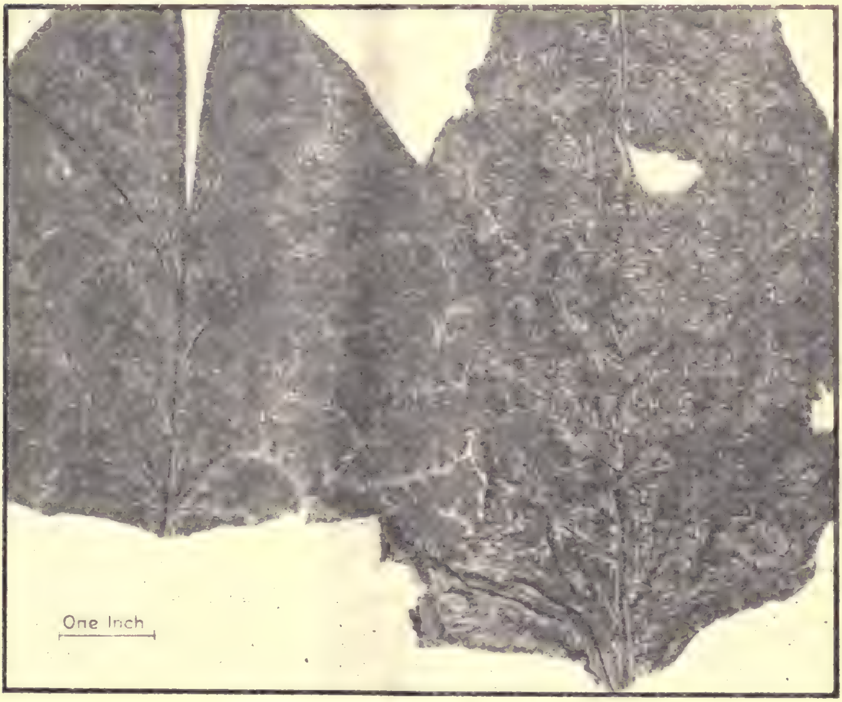



**Life History of *Anophothrips striatus*.**

1. Larval form. 2. Adult. 3 Fore-wing of adult. 4. Hind-wing of adult. 5. Spines on the hind margin of base of fore-wing. 6. Antenna of larva 7. Antenna of adult.

producing fine serrations on the outer margin. These striations appear to be caused by whorls of minute hairs. The larvæ, as they near the pupal state, have darker coloured antennæ, and the thorax and body are marked with yellowish tints.

The adult thrips has the eyes black or purplish red; ocelli red; and head yellow, with the tip of the cone-shaped mouth dusky-brown. The antennæ have the first segment light-coloured and the others clouded with brown, darkest toward the tips. The general colour of the thorax and the abdomen is yellow with brownish bands across the abdominal segments; the wings are yellowish-brown with black feathery spines along the margins. The antennæ are eight-




**Tobacco Leaf showing damage caused by Thrips.**

jointed, but appear as if nine by reason of the oblique suture crossing the sixth. The head is rounded in front, truncate behind, and wider than long. The prothorax is as broad as the head, straight on the sides and rounded behind; the mesothorax is larger, fitting close against the metathorax, which is contracted at the junction with the abdomen. The legs have the femora short and rounded, and the tibiæ of the hind legs longest. The wings are well developed and fringed with fine black hairs, and the abdomen is elongate, broadly rounded on the sides, coming to a tubular point at the apex, and composed of nine segments.

In dealing with all plant-infesting insects of this type, one must start from the beginning and find out where their eggs are deposited so that their original breeding ground can be treated. The thrips in the tobacco fields visited by the writer were depositing their eggs on the undersurface of the tobacco leaves, then nearly ready for cutting. Both the larvæ, in all stages of development, and the perfect winged thrips were feeding upon the leaves, which showed a discoloured mottled tint, as shown in the illustration. From their action a certain per centage of weight would be lost; and the dirt and excrement dropped all over the surface of the leaves would not improve the quality of the dried leaf. Fortunately the plants were so near maturity that the owners set to work and cut the leaves. These might have gained a little in weight if they had been left longer, but the owners wisely did not take the risk.

In some of the fields when the main crop was cut down the butt of the stem and the roots had been left in the rows; these threw out vigorous shoots, and the growers were expecting a second crop. On examining these shoots it was found that they were covered with winged thrips. As the maturing tobacco plants were cut, the winged thrips, disturbed by the operation, swarmed over every green thing left in the paddock, and among them were these second crop shoots.

The destruction of all plants and waste material in the paddock, either by ploughing in or burning, after the tobacco had been cut and removed, would destroy all the wintering thrips and their eggs. Spraying with a soda soap wash in the earlier growth of the tobacco plants would kill any active thrips larvæ. Some growers experimented with burning sulphur to the windward side of the tobacco plants, hoping thus to suffocate or drive the thrips out; the only result was the scorching of some of the foliage. Sulphur dusted on the underside of the leaves is very effective against thrips on orchard trees; but if sulphur remains on tobacco foliage near to the time of cutting it might spoil the dry leaf.

## Applied Entomology.

In earlier days entomology was looked upon as a pastime for the spare moments of those who cared to turn their attention to it, or as a business confined to dusty museums, without any practical application whatever; the true significance of the study was not then apparent. . . . Gradually the practical side developed, and has since continued to develop, until at the present time economic entomology is recognised by agriculturists as an important adjunct to the study of the actual crop production, without some knowledge of which the cultivator of plants is likely to meet with obstacles before his harvest is over, or his products in the hands of the consumer.—The Philippine *Agricultural Review.*

# Popular Descriptions of Grasses.

[Continued from page 314.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

## THE INTRODUCED CHLORIS GRASSES.

THE introduced Chloris grasses of greatest economic importance in New South Wales are Rhodes grass and *Chloris virgata.*

### RHODES GRASS (*Chloris gayana*). (Fig. 1).

Rhodes grass is a perennial grass characterised by an abundant leaf growth and surface runners, which readily root at the nodes. It was introduced into cultivation by Mr. Cecil Rhodes, of South Africa; and appears to have been first grown in this State by the late Colonel Sylvester Browne, of Singleton. It is evident that another grass somewhat similar to it, but very inferior in quality, was introduced about the same time. This is known as *Chloris virgata*, and for some time it was confused with the true Rhodes grass, for the two grasses appear identical during the early stages of their growth, though there is a distinct difference in the inflorescence. The seed spikes of *Chloris virgata* are compressed, scarcely opening out even in the mature stages, whereas those of Rhodes are well extended radially almost as soon as formed. In *Chloris virgata*, also, the seed florets are densely covered with long slender white hairs, very conspicuous in the field, whereas the hairs on *Chloris gayana* are scarcely noticeable.

*Soil and Climatic Conditions.*—Rhodes grass is now permanently established throughout Queensland and New South Wales, being grown more extensively in the former State than in the latter. It succeeds best on the alluvial or loamy soils, while it grows better than most introduced grasses on the lighter soils, particularly those of granitic or sandstone origin, such as are found in many of our wheat-growing centres and on the coast. It likes warm situations, and is extremely sensitive to frosts, being completely killed out in localities over 2,000 feet in altitude. It is a favourite grass to sow in "burns" on any part of the coast.

*Sowing.*—The seed of Rhodes grass is very small and light, and germinates, as a rule, rather badly. The low germination is due to the large number of barren or infertile flowers; and a fertility of 50 per cent., or a total germination of 35 per cent., may be considered very satisfactory for this class of seed. It pays, therefore, to have the land in fine tilth to ensure a good stand, and a farmer should certainly know the fertility of his seed before sowing, in order to plant the right amount. A rough way to determine the fertility is to rub a small amount on the palm of the hand; if the released grain appears plentiful the seed may be considered satisfactory. Only 4 to 6 lb. of good seed are required per acre, but 20 lb. is sometimes little enough when a large proportion of the seed sown is immature.

Broadcast sowing is advocated, and to ensure a good stand half the seed should be sown in a direction at right angles to the other half. In wheat-growing districts the seed can be sown through the wheat drill, if superphosphate or some other substance of the same texture, such as pollard, is mixed with the seed to enable it to run through the drill slowly. Advantage should be taken of favourable weather conditions for sowing, and it is worth while remembering that, although little moisture is necessary to germinate the seed, a fair amount is required to keep the young seedlings growing. When the runners begin to appear the grass can be considered to be well established, and will then stand a fair amount of dry weather. In coastal districts the seed can be sown in autumn up to April, or in early spring, such as in September. The seed will germinate at much lower temperatures than will paspalum. In wheat-growing districts also, September sowing is recommended, or, failing that, March.

*Pasturing.*—The mistake is often made by farmers of turning the stock on Rhodes grass at too early a stage. The runners take some time to root sufficiently strongly at the nodes to become firmly established in the soil, and early pasturing will pull these runners out of the ground, leaving a space for weeds to encroach on the grass, and eventually smother it. It has been found a good practice to allow the grass to come to seed in the first growth before grazing, and then stock. The leaves are certainly inclined at this stage to be somewhat harsh; but stock generally eat it all down if kept on it. Another alternative is to utilize the first crop for hay, the quality of which is really good. If desired, a crop of the seed can be obtained at the same time. After the first growth the grass can be stocked heavily at any stage, but care should be exercised to remove live stock when the grass is eaten bare.

*Rhodes Grass and Lucerne.*—It has been proved, both on the coast and in the wheat-growing districts of the slopes, that Rhodes grass and lucerne grow well together, and instead of the Rhodes grass crowding out the lucerne, as one would imagine from its running habit, it is really the lucerne that makes the more vigorous growth. It is recommended that 4 lb. of Rhodes grass and 2 lb. of lucerne per acre be sown. The protein content of the lucerne and the carbohydrate content of the Rhodes grass make an excellent balanced ration.

*Rhodes Grass in the Interior.*—That Rhodes grass will do well in the western district has been amply demonstrated, both by trials at the experiment farms of Cowra, Nyngan and Wagga, and also by private pastoralists. At Cowra the Rhodes grass paddock is now 3 years old, and is stocked and cut for hay alternately. At Nyngan it succeeded well until the present drought, which has gradually killed it right out, after it had stood up remarkably well to the dry conditions for some considerable time. Mr. H. R. Munro, a pastoralist, sowed 5,000 acres of cleared and burned country west of the Darling Downs about four years ago. Last year it had spread to 15,000 acres. He states that country that formerly was covered with turkey, hop, and kindred bushes, is now covered with Rhodes grass. It


**Fig. 1.—Rhodes Grasses** (*Chloris gayana*).

Note the characteristic creeping root system—perhaps better developed in this than in any other grass.

flourishes on black soil plains, formerly brigalow and belar forests, and quickly establishes itself if given a spell during seeding time. The young grass has good fattening properties, and the mature grass has equally sustaining properties.

*Rhodes Grass Hay.*—Rhodes grass makes excellent hay. Chemical analyses have shown it to possess a high nutritive value, while its aroma and palatability make it very acceptable to stock. The vivid green of the leaves and the fine stems give it a very attractive appearance. It produces heavy yields on the coast, and it is seldom that less than 2 tons per acre are obtained from two or three cuttings during the season. A Queensland report testifies to the fact that Rhodes grass chaff is in demand there, and will bring £10 a ton. Mr. Charles Binnie has also drawn my attention to the result of some analyses of Rhodes grass grown on rather poor soils near Brisbane, as compared with the analysis of a good sample of chaff. They show that even the second cutting of this grass, in the form of hay, has practically double the protein content of wheaten or oaten chaff. It was calculated that 38 lb. of Rhodes grass hay are necessary to supply 19 lb. of protein, the average daily requirements of a cow, and that 79 to 85 lb. of chaff are required to supply the same amount.

The grass should be cut for hay as soon as the seeds begin to ripen. The curing should be done as quickly as possible, as the strong summer sunshine rapidly bleaches the leaves.

*Harvesting for Seed.*—Rhodes grass ripens very irregularly, and cutting for seed should be carried out when a fair number of brown seed spikes are noticed in the crop. The protruding anthers render the pollen stage of the seed very conspicuous in the field, and about a fortnight elapses from this period to the hardening of the grain. The ripe seed very easily shatters, and care must be exercised if the best and ripest seed is to be obtained. A good plan is to place tarpaulin inside the wagons and the ripe seeds that fall from the sheaves will then be easily collected. The seeds having been stripped from the sheaves, the latter can be utilised for hay. Many seedsmen winnow the Rhodes grass seed received from growers and sell only the heavy proportion; other less scrupulous seedsmen, however, sell all the seed, which is invariably low in fertility.

*Rhodes Grass under Irrigation.*—A fair amount of this grass has been grown on the Murrumbidgee Irrigation Area, with good results. In a dry season difficulty is encountered in obtaining a satisfactory germination on the heavy clay soils, owing to the manner in which they quickly dry out and harden on the surface. The seed should, therefore, be sown as quickly as possible after a thorough irrigation, and when the seedlings are up the land should be irrigated at intervals of a few days until the root system is well established. It is invariably found that the grass will stand much more dry weather than paspalum, which, of course, is a big consideration, even on the irrigation area. The present tendency is, however, to favour paspalum as a dairying grass, and this is probably due to the fact that it will carry more

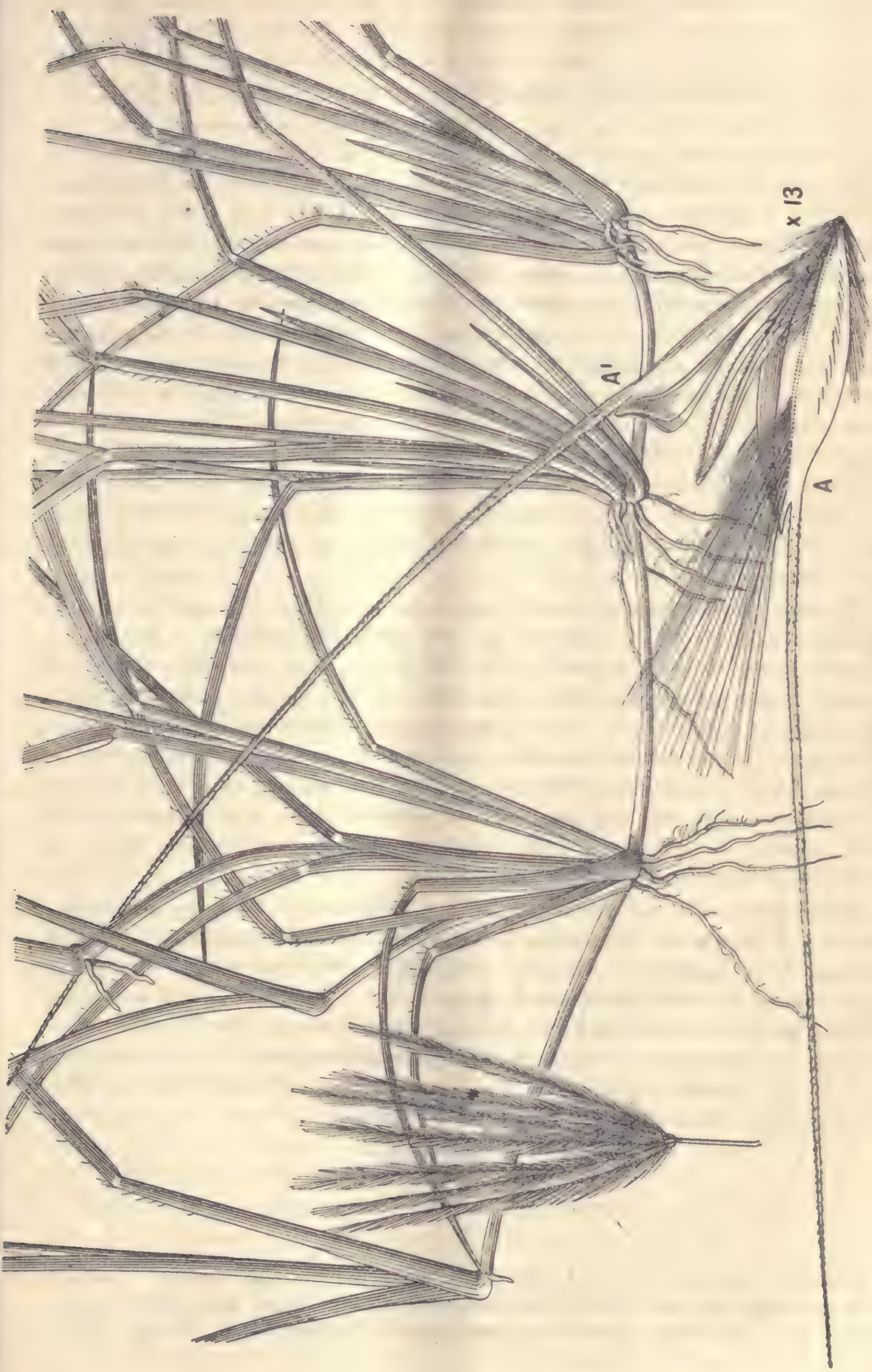



Fig. 2.—*Chloris virgata.*

This grass is distinguished from Rhodes grass mainly by the long and dense awns of the flowering spikelets.

and also endure more constant grazing than the Rhodes. Data, however, are absent as to the comparative milk-producing qualities of the two grasses, and it would not be surprising to find, if all the facts were ascertained, that Rhodes is a superior all-round grass to paspalum.

*Rhodes Grass versus Paspalum.*—There is no doubt that paspalum has run riot throughout the greater portion of the coast of New South Wales, mainly because of its remarkably vigorous growth under moist summer conditions, and its habit of quickly spreading throughout river flats and other low-lying areas. That it will carry more stock in ordinary seasons than Rhodes grass cannot be denied, but at the same time it can be confidently stated that it will not maintain stock in as good condition as the Rhodes. Paspalum will grow well in America, yet its cultivation is not recommended by the American Department of Agriculture, while Rhodes grass is strongly recommended for certain localities. Farmers' bulletins have been issued there on Rhodes grass, but no bulletin has been published on paspalum. There are many farmers in New South Wales who regret the day paspalum was introduced to their farms, owing to the manner in which it crowds out everything else its rapid entry into their summer crops, and the manner in which it mats the soil after a few years, and diminishes rapidly in carrying capacity and nutritive quality.

Rhodes grass, however, can be grown on any farmer's property, and, if not grazed too strongly, will hold its own with the paspalum. A plot of Rhodes grass at Wollongbar Experiment Farm, with paspalum alongside, has now been growing for some years and hardly a single paspalum plant can be found in the plot. It is a good practice to have the Rhodes grass on the higher ground rather than the lower, because paspalum is most aggressive on the flats. A paddock of Rhodes grass on the property of Mr. J. Giblin, Nambucca River, was laid down in 1913, and in spite of constant grazing and cutting is still in splendid condition, and similar results could be obtained on practically any part of the coast.

*Chloris virgata* is not recommended for cultivation owing to its annual habit and (compared to Rhodes grass) its less palatable character. It has become very aggressive wherever established, the light seeds, which are easily blown about by the wind, helping toward this end. It will encroach rapidly on lucerne land, and materially affects the stand. So far it is confined to coastal districts only, and is very common on parts of the northern rivers. It appears also to have become fairly well established around Penrith and Richmond.

(*To be continued.*)

"I CANNOT express to your Department what a help the *Gazette* is to us returned soldiers, who for the last four or five years have got quite out of touch with the strides that have been made in farming."—A Wyong correspondent.

# Safeguarding Farm Stock from Disease.

## (2) By Good Hygiene.

MAX HENRY, M.R.C.V.S., B.V.Sc.

The means by which the farmer may hope to minimise the risk of introducing infectious disease into his stock having been outlined, attention must be now drawn to the serious losses which occur in New South Wales among stock, particularly young stock, from both infectious and non-infectious complaints through lack of attention to the principles of good hygiene. There is too often a tendency on the part of the farmer and stockowner to regard veterinary science as only capable of coming to his aid when stock are already sick, forgetting that the most valuable part of veterinary advice is that dealing with prevention, and that it is along these lines that the future development of the science will be most marked.

This attitude of the farmer is due to the fact that throughout the earlier years of Australian colonisation and settlement, stock practically looked after themselves, and the question of good or bad hygiene never had to be considered. But to-day, in the settled parts of the country—particularly in dairying districts, on pig farms, in irrigation areas, and wherever stock are under more or less confined and artificial conditions—the question of good hygiene becomes one of the first importance. The prevailing opinion among farmers appears to be that good hygiene is a kind of fad—bred by Science out of Laboratory—but of no kind of use to the man making a living out of stock. Nothing could be farther from the truth, though it is admittedly difficult to say at what precise moment the observance of good hygiene puts a fiver into a banking account. It is also argued that because stock thrived in the old days under such and such conditions, they must do all right now. To hold such opinions a man must have forgotten many things; such things as the actual changes which have taken place in conditions, the greater economic value of the individual animal, the totally different position as regards disease, and the fact that as this country progresses, these changes in every way will become more and more marked. It is wiser to look ahead to what we have to do than to look back on what our grandfathers did; and it is of far more value to the farmer to understand what good hygiene means than to possess any number of isolated and more or less correct ideas as to the treatment of sick stock.

The treatment of sick stock is of value at long intervals—good hygiene is of value at all times. Even in parts of the State where stock are running freely in wide areas, certain aspects of the question, as will be seen later, are of considerable importance. By good hygiene is meant the correct application of those systems of stabling, housing, grazing, sheltering, grooming, clipping, clothing, feeding and watering which are most conducive to the good health and economic efficiency of the animals.

### Site and Aspect as Factors in Healthy Housing.

A very considerable proportion of disease and mortality can be more or less directly traced to errors in constructing the buildings in which animals live all or part of their time. Although for each kind of animal different considerations carry weight, yet there are certain principles common to the proper construction of all buildings intended to house stock. These will be considered first, and the diseases noted which to a greater or lesser degree are associated with them.

In selecting the site for stables, cow-sheds, and pig and calf pens some freedom of choice is generally offered to the farmer. These structures should not be placed on low-lying swampy ground, or on ground liable to be flooded, or they will always be damp and probably associated with chills and rheumatism; while the animals, having to expend so much of their food in maintaining bodily warmth, will not thrive so well as those in drier and better situated buildings.

Buildings are better on higher land, which can more readily be drained. It is also desirable to take into consideration the dryness of the soil. A shallow soil with a clay subsoil, for example, is not the most suitable, and alluvial flats and "made soils" are unsuitable places on which to place buildings for stock.

This is often important—partly in relation to its effect on the health of stock and partly because it affects the comfort, not only of the animals, but of those working among them. Whenever possible, in most parts of this State, a southerly or westerly aspect should be avoided, and shelter from the south and west secured. Despite the great heat of summer in many parts of the State, more loss is certainly occasioned by the cold of winter, and anything in the housing of stock that tends to protect them from southerly and westerly winds is of advantage. Continued exposure to cold westerlies when the animals are confined in small pens which prevent them exercising themselves will rapidly lower their vitality and disease-resisting power, especially in the case of young stock, and will retard their development by forcing them to devote so much of their food toward the maintenance of body temperature. In like manner the sudden changes of temperature which occur with southerly winds and winter storms are liable to produce catarrh and pneumonia in all classes of stock exposed to them, particularly when such exposure follows recent shearing or clipping, de-trucking after a long railway journey, sudden release from close confinement in a hot atmosphere, or over-heating from some other cause. After sudden falls in temperature or cold rain, semi-starvation often leads to heavy losses. Penned animals have no chance of taking advantage of shelter afforded by the ground and suffer accordingly.

The selection of an east, north-easterly, or northerly aspect has the further advantage of catching the morning sun in the winter and allowing sunlight to enter freely into buildings all the year round. The top of a ridge is never a good place for housing stock or placing cow-bails; on such a site the buildings are exposed to all the winds that blow.

### Stables.

In this country, where so few horses apart from those in the cities are stabled, this question is not of such importance as in Europe or America, but the main principles which should govern the construction of a stable may be touched upon. Firstly, if the horses are to live in the stables and are not merely put in for an hour or so when feeding or at odd times, a floor impervious to moisture is necessary. In good stables these floors are made of tiles (non-slipping) especially manufactured for the purpose. Concrete makes a good impervious floor, but is slippery, and is apt to break up under the weight of the horse. Bricks set in mortar are good for a time, but wear into holes. Wood is often used, and if solid beams such as railway sleepers are used, and the space between each is well rammed, a very fair floor can be made, but moisture will eventually soak in. Another type of wooden floor is composed of strong battens with spaces left between so that the urine runs through into drains cut under the stable, but sooner or later the earth there will become a cesspool. In many cases the earth is simply rammed hard, but such floors are easily broken up and the part immediately around the animals' hind legs is apt to become a quagmire. No flooring can be considered satisfactory which can become permeated with urine. The effect of such a state of affairs is bad in two ways—the ammonia given off from the urine and dung renders the atmosphere unhealthy, and the constant standing in a mixture of urine-soaked dung and earth is one of the commonest contributing causes of thrush, canker and other diseases of the horse's foot.

In cases where horses are only brought into the stable for feeding, the earthen floor is quite satisfactory, providing it is kept clean and free from dung, and prevented from working into holes.

Ample light is necessary in all stables—in fact, in any building in which stock are to live ; darkness and dirt and disease have always gone together. It is difficult to understand the reason which prompted the builders of old stables to exclude so much light, but they certainly did so. The confinement of animals in semi-darkness during the daytime must to some extent act deleteriously on the eyesight, and has been by some associated with periodic ophthalmia. Ventilation must be provided, but in such a way that it does not create continuous draughts through the building. For this reason overhead ventilation is of very great value, allowing as it does free escape for the heated air rising from the stable. No living rooms or feed stores should be placed over a stable. This is another matter in which most old stables are faulty, the idea apparently having been to create as stuffy and unhealthy an atmosphere as possible. The stable walls may be of brick, wood, or other material, and if the inside is smooth so that it can be washed down and disinfected so much the better. All doors and passages in stables should be wide and high, for many a horse has been seriously injured when passing through narrow and low doorways. The height of doors should be 8 feet and the width not less than 3 feet 8 inches. Stable doors are usually divided into two parts, lower and upper, so that the smaller upper portion

can be left open for ventilation and light. Every stable should possess some means of ventilation, such as a louvre board window which cannot be closed under ordinary circumstances.

A good stable should be about 18 feet wide, the divisions between the stalls being 9 to 10 feet long. A stall for cart horses should be about 6 feet wide, but it may be narrower if it is only to be used as a feeding stall. A loose-box should measure 12 feet by 10 feet, and a little more for heavy stallions.

The drainage of stables, unless attached to a sewerage system, should be open. Closed drains, unless very well flushed and easily opened up for cleaning, are a constant source of trouble.

### Cow-sheds.

In dealing with this subject, four types of buildings have to be considered:—(1) buildings in which the cows are milked, fed and housed at night during part of the year; (2) combined milking and feeding sheds; (3) milking sheds; and (4) feeding sheds.

Very few buildings of the first type are in use in this State, although probably as the country develops and becomes closely settled they will become more common, especially in the colder parts. The essentials of such buildings are impervious floors, proper light and ventilation, and efficient drainage of the open type. As with all buildings for cattle, site and aspect should be given special consideration. There is usually a tendency to make these buildings too dark, a condition which militates against cleanliness.

Combined milking and feeding sheds are now fairly common, and so long as shelter from the cold winds is provided they cannot be too open. The best type is a plain open shed, with a double row of bails arranged so that the cows' heads face inwards, and a central passage-way down which the food is taken either by truck or hand. The floor must be impervious to moisture, and nothing is better than concrete. Stone grouted in with cement may be satisfactory, but the cement is always liable to work out. Bricks set in mortar wear into holes, and wood sooner or later becomes urine-soaked. Behind where the cows stand should run a concrete open shallow drain to lead the urine out of the yard.

So long as it is open and well ventilated, it cannot be said that any one type of milking shed has much effect one way or the other on the health of the animals, but it is of importance from other points of view. Sheds which are only used for milking require the same type of floor and drainage as that used in the combined sheds, but are usually much smaller and only allow for four to a dozen cows to be in the bails at a time; protection from the south and west is most desirable. Feeding sheds should also be built with due regard to aspect, and should preferably be quite open along one side, unless local conditions as to cold would render such exposure excessive; such is not the case through most of our dairying country where alone cattle are likely to be stall fed. For the floor, earth well beaten down will suffice.

The feeding boxes should be detachable or be provided with plugs so that they can be thoroughly washed and disinfected. Contagion can occur if different cows use the same feeding boxes and they are not cleaned out. Moreover, souring food has a bad effect on a cow's appetite.

### Calf-pens.

It is usual to provide some small shelter for the calves when feeding, and to have a small yard attached thereto. Calf-pens are responsible, more than any other buildings, for the spread of disease. The flooring, both of the shed and yard, should be of concrete, sloping gently to allow of washing down, and should be kept clean. Whether the calves are fed from buckets or troughs these should be frequently scalded, and the woodwork of the miniature bails, if such are used, should be disinfected regularly. The diseases which calves contract through dirty pens and yards are navel-ill, diarrhœa, dysentry, white scour, pneumonia and ringworm; the only way in which to prevent infection from these sources is to provide places such as can be kept scrupulously clean. Objectionable features often seen in calf-pens are saturation of the earth floor with fæces and urine, and the caking of the wooden trough with drying and souring skim milk and other food; the first condition encourages the introduction of the organisms of disease through the navel of newly-born calves, and both conditions tend to infection by way of the digestive tract. Fences, again, are often seen soiled with fæces showing evident signs of dysentery and white scour. Shelter is generally absent, so that the calves shiver in the cold and bake in the heat. Barring the pig, no animal is kept under such bad hygienic conditions as the calf on some dairy farms, and no young animal is more subject to disease and has less disease-resisting power—largely, of course, because calves are deprived of their natural food supply and are kept crowded together. There is therefore all the more need for the application of sound hygienic conditions in their housing.

### Pigsties.

Much of the foregoing may be applied to the subject of pigsties. Structural defects—especially in the flooring—must be regarded as a contributing cause of much illness and mortality from rheumatism, pneumonia, swine fever, swine plague, and parasitic infestation. Both sty and yard should possess an impervious floor, and concrete probably forms the most suitable. The animals should be provided with a wooden flooring for sleeping, but this should be removable, and should be removed to clean out the sty. Opening off from the small yard there should be provided (especially for breeding stock) a small paddock or exercise yard. Drainage requires to be free, and for this reason the slope of a hill, if not too steep, provides the most suitable site for sties. The sties themselves are frequently built low, but this has two disadvantages—they are difficult to clean, and sunlight and air do not get free enough entrance.

In pens intended for brood sows, a guard rail should be fixed a few inches out from the wall all round in order to prevent the sow overlying the young. Ideal feeding arrangements for pigs are such as limit their opportunity to

urinate, defæcate or tread about in their own food. Without such limitation one pig affected with tuberculosis may infect any number, and parasitic infestation and swine fever may be transmitted in the same way.

### Fowl-houses.

In constructing fowl-houses the same necessity for an impervious floor does not exist, but the walls and all fittings should be as smooth as possible with the materials available. Rough wood and bark offer very favourable cover for fowl-tick, lice and other parasites. The floor, if not impervious, should be of well rammed earth, and should be kept level and hard so as to facilitate the removal of droppings. It is perhaps unnecessary to add that the roof should be watertight, the house closed in from the direction of the prevailing winds, well ventilated, light, and high enough to permit of cleaning out being performed in comfort. If these desiderata are provided, the material and methods of construction may differ to any degree.

(*To be continued.*)

## A Case of Bee Paralysis.

The following extract from the letter of a bee-keeper may be said to describe a typical case of bee paralysis: "One of my last colonies seems sick; to-day there are hundreds of dead and dying bees in front of the hive, and although there are many bees working and seemingly strong, yet when I removed the cover they were thick on top of the frames and were not able to go down when smoked. When I brushed them with my hand they rolled over on their backs and could not gain their feet for some time. The colony has been a heavy producer. . . . They are pure Italian bees and have been free from any disease up to this last two days. I have thirty colonies at present and would not like disease to get among them if it is possible to prevent it."

"After taking note of the symptoms mentioned," wrote the Senior Apiary Inspector, "I consider that the bees are affected with genuine bee paralysis, and the only reliable cure for such a case is to destroy the queen of the affected colony and then introduce a queen from healthy and vigorous stock. Usually, in New South Wales, only odd colonies are severely affected, and you should not have trouble to any extent so far as your apiary in general is concerned. Care should always be taken when rearing queen bees to select eggs or larvæ from stocks that show the greatest immunity from the disease, which appears, as in the case under notice, to be a constitutional trouble of the queen and somewhat hereditary."

## To Destroy the Mole Cricket.

An insect which sometimes causes considerable damage to the barbered surface of garden lawns, and the turf of such places as the "putting" greens on golf courses, is the mole cricket (*Gyllotalpa*, sp.). The best means of dealing with these insects is to scatter poison baits where they make their burrows or congregate. To make the bait, mix 1 oz. of paris green with 16 oz. of bran, and a tablespoonful of salt; when thoroughly mixed, add water, and bring the whole to the consistency of a bran mash. In some situations the insects can be destroyed by merely drowning out.—W. W. Froggatt.

# Thompson's Improved and Navelencia Oranges.

W. J. ALLEN and W. le GAY BRERETON.

DURING the past two years there has been some discussion as to the identity of Thompson's Improved and Navelencia oranges. The United States is the country of origin of both varieties. Describing them, a report received from the United States Department of Agriculture says: "The Thompson strain (frequently called Washington Improved or Thompson's Improved) has been extensively propagated commercially, and is generally recognised in California as an established variety." Then follows strong evidence that the Thompson strain is a sport from the Washington Navel—in other words, a strain of the Washington:—

> The trees of the Thompson's strain [Thompson's Improved] are heavy and regular bearers, have an open and drooping habit of growth, dense foliage and large dark green leaves. As a rule the trees of this strain are not as vigorous growers as those of the Washington under similar conditions. The fruit is similar in shape and size to that of the Washington. It differs mainly in having a very smooth rind of a bright reddish orange colour. The rind of the Thompson's fruit is thinner, and the rag more abundant and coarser than that of the fruit of the Washington. The smooth texture, bright reddish colour and handsome appearance of the fruit is of distinct value from the market standpoint. The juice usually is less acid than that of the Washington, and is lacking somewhat in flavour. The undesirable characteristic of the rag, and the inferior quality of the juice are detrimental to the reputation of the fruit of this strain [Thompson's Improved]. The fruit is seedless, and the navel variable in size and arrangement, usually medium to small, occasionally rudimentary.
>
> The Navelencia is a name which has sometimes been given to the navel strain of the Valencia variety. The trees have habits of growth and production similar to those of the Valencia. The foliage is usually rather dense, the leaves are small and rather pointed in shape.
>
> The typical fruit resembles the fruit of the Valencia in shape, size and colour, but differs from them in having a smoother texture of skin, thinner rind, more acid juice, fewer seeds, and a small, often rudimentary navel. This strain occurs occasionally as individual fruit and limb sports in trees of the Valencia. It has been isolated in commercial propagation, and is grown to a limited extent under the name of Navelencia.
>
> This strain is especially interesting from the fact that there is a possibility of isolating from it by bud selection a seedless strain of Valencia.

The foregoing descriptions can be taken as authentic, as they not only come from the country of origin of both varieties, but also after a very thorough research of bud variation by the United States Department of Agriculture, both in the Washington Navel and Valencia oranges. From them we must conclude that, in by far the greatest number of cases, trees planted in New South Wales under the name of Navelencia have actually been Thompson's Improved.

In New South Wales Thompson's Improved has proved to be of inferior flavour to Washington. It is earlier and is very liable to lose its juice if allowed to hang after midwinter. For this latter reason it should only be planted very sparingly and marketed early, or there is a danger of its bringing discredit on the much-valued Washington Navel. Observations are being especially directed to the hanging qualities of the directly imported Navelencia trees at Hawkesbury Agricultural College, as the few points of superiority which can be claimed for this variety over Valencia will be of little value if it has not the long-hanging characteristic of that variety.

# Poultry Notes.

## JULY.

JAMES HADLINGTON, Poultry Expert.

THE splendid rains that have fallen over the State recently, together with the more optimistic reports regarding the prospects in other countries, have brightened the outlook for poultry-farmers.

It would be an almost unprecedented circumstance, if, notwithstanding the crops being somewhat late, sufficient wheat was not harvested for home requirements after such bountiful rains. Taking all the circumstances into consideration, the position resolves itself into this: Those who can manage to feed their stock during the next few months have every prospect of better times ahead, because it is almost certain that high prices for poultry products will obtain for some years to come.

The confidence displayed in the poultry industry in face of all the troubles through which we are passing was commented upon last month. The writer's experience covers four partial or full failures of the wheat crop, and consequent feed crises; but notwithstanding that the present one is the most severe of all, as far as can be judged there has been less sacrifice of stock in proportion to the number kept than on the three previous occasions. True, up to the drought of 1901–2, poultry-keeping was but little more than a side-line, but since then it has grown into a specialised pursuit, and has taken its place among our primary industries. Notwithstanding all our troubles, there is more confidence in the possibilities of commercial poultry-farming to-day than at the time mentioned. Failures there have always been, even in the best of times, for not everyone will make a poultry-farmer, but as a class those who go into the business are not wanting in "grit," nor in determination to succeed, notwithstanding that they are often handicapped by want of capital and experience, and that the latter is nearly always dearly bought. The present crisis will pass as others have done, and there need be no fear for the permanency of the industry. There is one factor in favour of poultry-farming not enjoyed by the breeders of larger stock. No matter how flocks are depleted, two good hatching seasons can see them almost back to normal.

### The Hatching Season.

The hatching season is now upon us, and it is a fortunate circumstance that prospects have been brightened by the rain; otherwise, notwithstanding the advice given in these notes to go on hatching, a great falling off in the number of chickens hatched must have resulted.

Nothing but sheer inability to secure food should now retard the hatching season. There is no question about the wisdom of hatching to full capacity. In regard to feeding we should visualise the position in this way: Suppose

1,000 chickens are to be hatched and reared in regular batches from now to the end of September, taking into consideration that only a small proportion of the total number will be hatched in June and July, and that the greater portion will come out in August and September, the mean average feed requirements to the end of the year (when the new wheat will be coming in) will be about equal to that of 500 adult birds. In fact, seeing that at least portion of the cockerels will have been marketed at four months and under, probably an estimate of feed for 400 adult birds would be nearer actuality. In other words, 1,000 chickens hatched during the months indicated will only represent the cost of feeding 400 adult birds. This is pointed out because the novice poultry-keeper is only too apt to calculate the cost of feeding on an adult basis for the whole output.

### Economical Feeding of Chickens.

In these times of high cost of feeding, and when every economy is necessary, it might be pointed out that it has become fashionable to feed chickens on more or less expensive mixtures. The question arises how far this is necessary. The writer has had experience of feeding chickens on the most simple rations, and has successfully raised hundreds of thousands on nothing more than crushed wheat and maize, together with pollard and bran, the last two forming three-fourths of the total daily ration, with of course, the usual green feed.

### Feeding and Care of Breeding Stock.

It is not recognised to the extent that it should be how much the results of the breeding season in fertility and strength of chickens depend upon the care and attention bestowed upon the breeding stock. It is not sufficient to mate up the breeding pens and to feed, water, and attend to them as if they were ordinary flock birds. Much more is needed. Extra care in feeding will be time well spent. The birds should have all they will eat and of the the most appetising food. They should be neither under-fed nor over-fed—and by over-feeding is meant that the food should not be allowed to lie about the yard. The birds should be kept keen for their food. This is commonplace advice, but it will stand repeating until it has still more thoroughly permeated the consciousness of the average poultry-keeper, and particular care should be taken to keep the male birds well fed. If the males are seen to be hungry and appear to be eating well this should not be taken as a sign that they are taking plenty of food. Very often it is evidence that they are not getting sufficient to eat. On the other hand, if they are indifferent to their food it may prove that they are not taking sufficient. Under these conditions the birds rapidly become light in weight, with consequently lowered condition. This calls for special feeding. A feed of maize given at midday is the best way to maintain condition. The bird should be got to one side or inside the poultry-house, and the attendant should arrange so that the hens do not get the food intended for the male. A handful of maize is the best food for this purpose, as it is eaten up more readily, and thus saves the time of the attendant.

### Segregation of the Male Birds.

Old fallacies die hard, and one still finds the idea prevalent that the male birds should only run with hens during the breeding season. Experience, however, proves that many males, particularly of the heavy breeds, become more or less (and sometimes totally) impotent, as a result of this practice. There are, of course, some more or less plausible reasons given for segregating the males, but whatever may be advanced in this respect, the fact remains, and all we can do is to make the best of circumstances over which we have no control.

Another practice that is growing up is to change the male birds in the breeding pens frequently with the idea of increasing the vigour of the birds. This also is a fallacy, except in the case of under-feeding. With well-fed, healthy, vigorous birds (and no others should be used) there is no necessity for this practice. Not only so, but there is the objection that pedigree cannot be properly recorded when changes are made in this way. Any good bird well looked after should stand right through the season naturally.

### Not Too Much Protein.

It is not desirable that too much meat or meat concentrates should be fed to the breeding stock. The balanced ration, as fed to laying hens, might with advantage be somewhat widened for breeding stock. The object in regard to this class is rather to produce strong eggs than to make high egg records, and it is not always that both are secured. Many poultry-keepers feed a greater percentage of proteid matter to their breeding pens, being under the impression that the more meat they give the better. This is a mistake that often results in partial failure to hatch and rear chickens. Any kind of stimulation is likely to produce the same result.

All highly concentrated foods such as meat meals, &c., should be given by weight. For convenience, a measure may be used, of course, but the weight of the quantity that the measure will hold should be known, and should be kept in mind when making up a ration. Guessing quantities is almost certain to lead to trouble of one kind or another. Many cases of enteritis occur among flocks owing to neglect of this simple precaution. The same thing applies to common salt when used in excess or carelessly mixed through the food.

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## Almond Trees as a Vineyard Border.

Almond trees may be used attractively as a wind screen on a vineyard border. The planting of seedlings is not very satisfactory, as there is a likelihood of getting a very mixed inferior lot. The better way is to raise from seed and bud the young trees with good varieties. More than one variety must be planted in order to ensure cross-pollination. Up to the present the almond has proved more suited to the country west of the mountains than on the coast, although it is considered that in the drier parts of the coastal districts it could be grown profitably. The country lying between Campbelltown and Richmond, and any with similar climate and soil, should produce satisfactory almonds.—W. J. Allen.

# Orchard Notes.

## July.

W. J. ALLEN and W. le GAY BRERETON.

### Frost and Dry Weather.

Many of our coastal districts are experiencing unusually heavy frosts. While such winter frosts are beneficial to deciduous fruit trees, they are liable, if continuous and accompanied by dry weather, seriously to affect the hanging crop of citrus fruits. Oranges, lemons and mandarins may show no external frost injury, but will be found lacking in juice. This defect increases as the fruit is kept hanging, and citrus growers who are experiencing frosty and dry conditions should market the fruit from the exposed part of the trees as early as possible in the season. Under ordinary conditions, Thompson's Improved Navel will, as a rule, turn dry early in the season, and should always be marketed early on that account.

### Ploughing.

Winter ploughing should be pushed forward this month and completed not later than early in August. This work should be put through in good time in order that the soil may absorb the late winter rains, and so that the manure, cover crops and weeds ploughed under may have a chance to rot and make available the plant food they contain for and when the trees require it in the spring.

### Manuring.

If the trees require it, manure can be applied at the winter ploughing. Only a small area should be spread at a time, so that it will be ploughed in the same day, for if rain falls before the manure is covered much of it may be washed away. In small areas, where it is practicable, it is a good plan to spread the manure along each furrow, turning the next sod on to it. Such manures as nitrate of soda or sulphate of ammonia could be applied in the spring.

### Pruning.

Apples and pears will this month be in a good condition for pruning. The two types of yearling laterals that these trees carry are not always recognised; one has well-developed plump eyes, and the other poorly developed, almost blind eyes. In such varieties as Jonathan, where, as a rule, the first mentioned type of lateral largely predominates, the pruner has little to trouble about, as by giving all the yearling laterals plenty of length and shortening he thin ones more than those that are stout and strong, the great majority will develop spurs along their length and only in rare exceptions will laterals remain bare.

Both types of laterals, however, are noticeable in such varieties as Rome Beauty, where the lateral with poorly developed, almost blind eyes usually predominates. Such yearling laterals will not spur along their length, but will develop only one or two spurs near their extremity, while the remainder of the lateral will remain bare. On the same tree will also be found the other type of lateral, with well-defined plump eyes. This type can be given plenty of length according to its strength, and will develop spurs at each eye. The character can easily be detected, and without checking the speed in pruning can be dealt with as suggested.

As a rule, Rome Beauty throws a greater percentage of these laterals with well-developed, plump eyes when growing inland, beyond the tablelands (especially in granite soils of our southern wheat areas) than when growing on the coast and tablelands—especially, in the latter case, in heavy or rich deep soils. In fact, after the trees in some of the southern wheat districts are 5 or 6 years old, they will throw the greater percentage of their laterals with well-developed eyes. The secondary lateral (that is, the extension the yearling lateral makes) is generally more prone to carry these well-defined plump eyes than the primary (the one direct from the main limb.) This gives a hint as to the treatment of the lateral with poorly developed, blind eyes. The habit of throwing laterals with well-developed eyes is, however, apparentlyinherent in certain trees, as one comes across it in odd trees where the neighbouring trees of the same variety, under identical conditions, exhibit quite the other character.

The varieties Jonathan and Rome Beauty have been chosen to illustrate the point under discussion, but the principle applies to apples and pears generally. Granny Smith is very variable, giving chiefly one type of wood under some conditions and the other type under others. The Williams pear is variable in a similar manner.

The treatment of the yearling lateral with the poorly developed eye is more complicated than that of the lateral with the well-developed, plump eye, and the results are not so consistent. Laterals not over 3 inches long with a terminal fruit eye (often called a fruiting shoot) can be left untouched; they will crop, form a club (sometimes with a spur just behind the club) and often make a couple of small extensions. The extensions can be removed next season, and as a rule the shoot will not extend again, but will form spurs either from the club or immediately behind it. The length of bare wood between the spurs at the club and the junction with the main limb is really an advantage, as it gives space for the fruit to hang. Exactly the same thing will happen to the longer lateral if left, but the trouble is that there will be too great a length of bare wood carrying no spurs. Such a yearling lateral, therefore, should be cut hard back. It will then make one or more shoots according to its strength and position on the tree, and often a spur immediately behind the shoots. Sometimes this shoot (being a secondary lateral) will be of the type with well-developed eye, and a length of it can be

left to develop spurs; but if it is of the type with poorly developed eye and of light growth it can be removed, leaving the spur. This will then behave like the fruiting shoot previously described, and its later treatment will be similar. If the secondary lateral is of strong growth it is better to leave a short length, when it will behave as the primary lateral did, and the next season can be brought back to the new spur that has formed.

As the trees get older and give up their heavy growth, the laterals will be lighter and when cut back (especially on the lower part of the tree) will not make long shoots again, but spurs or fruiting shoots, the management of which is easier. While the trees are young and making very vigorous laterals, the formation of spurs can be precipitated by shortening the laterals hard during the latter half of the summer.

### Scions.

Where grafting scions are required for working in the spring they should be collected during pruning from well-grown trees that have hitherto given regular crops of a good type of fruit.

### Spraying.

With the exception of the early-starting peach trees, such as Bell's November and Edward VII, which should have been sprayed last month, it is now a good time to apply lime-sulphur (winter strength) for peach leaf curl.

Trees with San José scale may be treated now with either lime-sulphur or miscible oil. In bad cases, it would be advisable to give a second application before they start in the spring.

For mussel scale on apple trees, miscible oil should be used in the proportion of 1 to 15 gallons of water, instead of 1 to 25 gallons. If a second application is given, reduce the strength to 1 in 25.

Apple trees badly affected with woolly aphis should be sprayed with tobacco wash or one of the commercial nicotine extracts. The treatment of trees only slightly affected may be delayed.

### Codlin Grub Bandages.

Bandages left on the trees for codlin grubs that have been driven from other resting places by winter rain or cold should be examined and the grubs killed. Any spare time can be usefully employed in the examination of any crevices or loose bark. Codlin and tip moth grubs found in such shelter should be destroyed before spring.

### Planting.

It is still not too late to plant out deciduous trees if the ground is in fit condition. In districts where the ground is still dry and no irrigation is available, it would be better to delay this operation in hopes of further falls of rain.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*Have you tried grading potatoes, and is it profitable? If so, at what stage do you carry out your grading—in the field when digging, or in the barn? For what characters do you grade, and do you include size, malformation and disease damage?*

*What advantage do you attach to the different types of ploughs—disc or mouldboard—and under what conditions do you consider each should be used?*

*Have you ever tried stable or cow manure for maize? What are its immediate effects on yield, and for how long does its application affect subsequent crops? Do you favour heavy or light applications?*

*What spraying are you doing this winter? Do you prefer miscible oils to concentrated nicotine extracts? Have you ever noticed any ill effects from the use of miscible oils, and does your experience suggest that they are better used when the sap is moving rather than when the tree is dormant? Have you observed any greater activity among aphis when the sap is moving, and does that suggest to you when the spray can be most effectively applied? Have you found iron-sulphide act satisfactorily as a control of apple mildew?*

*Are you sure all your cows are earning the cost of grazing and the labour spent on them? If not, have you thought of herd-testing in connection with the matter? The spring is the most suitable time to start testing, and the Department is prepared to afford assistance and advice. Do you think a testing unit could be formed in your district, and how many cows would be offering for the first twelve months?*

*To what do you attribute the movement from the country to the city, and what do you think would tend to restrict it? Would you expect the cultivation of a community spirit, the provision of improved educational facilities, and the increase of home and farm conveniences to operate in that direction?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.*

### Bimbaya.

At a meeting on 13th May, Mr. G. Alcock presiding, an address was given by Mr. A. T. Brown, Dairy Instructor, on the culling of dairy herds with the aid of herd-testing. Every cow's worth should be positively proved, and the water disposed of. Most dairy farmers might be able to pick out the very best cows in their herds, but they could not speak with certainty of the long line of doubtful animals.

### Borenore.

A branch of the Bureau has been formed at this centre, the following being elected office-bearers:—Chairman, Mr. N. King; Vice-chairman, Mr. T. Millgate; Hon. Secretary and Treasurer, Mr. G. Henderson. The benefits attached to membership are being energetically pressed, and the suggestion is under consideration that a crop-growing competition be held among members next season.

The monthly meeting was held on 2nd June, when Mr. R. C. Bell, M.R.C.V.S., gave a lecture on common ailments of farm animals. The time at the lecturer's disposal was too limited for him to teach all that the members wished to know, and it is hoped that his next visit will be of longer duration.

### Clovass.

The monthly meeting was held on 30th May, when the only business transacted was of a general character. In the election of a Secretary *vice* Mr. S. L. Cox, the choice fell on Mr. J. Boston.

### Cotta Walla.

A meeting was held on 3rd May, when thirteen members attended. The wheat, oats and barley plots were discussed by Mr. J. Wray, and the flax and linseed industry by Mr. E. Rowe. The latter paper dealt with the cultivation and harvesting of the crop, and the keen demand for the fibre. The progress the industry was making in the potato districts of Victoria was also pointed out. An experiment plot of linseed that is being grown by Mr. G. W. Butt will be watched with great interest by the members.

### Cunningar.

A large and representative gathering of members took place on 4th June, to hear a lecture on summer fodders by Mr. G. C. Sparks, Inspector of Agriculture. After the lecture four new members, all returned soldiers, were enrolled.

### Garra-Pinecliff.

A meeting was held at the residence of Mr. H. Robards on 1st April; there was a fair attendance. After the usual business was put through, a discussion took place on the pickling of wheat. The matter was well discussed, and it was finally decided that the following proved a success:—2½ lb. of bluestone to 20 gallons of water. A large cask was most suitable for the purpose. After dipping the wheat for a few minutes, it should be allowed to drain, then dipped again into a solution of lime made by adding 3 or 4 lb. of fresh lime to 20 gallons of water. By this method the whole of a farmer's seed wheat could be treated a month before sowing, without any fear of harm being done to the wheat by the bluestone.

Departmental Note.—The Chief Inspector of Agriculture remarks that the Department recommends the use of 1½ lb. bluestone to 10 gallons water, and ½ lb. freshly-burnt lime to 10 gallons water.

### Glenorie.

At the monthly meeting held on 27th March, a discussion took place on the Eureka lemon. A few members have the lemon planted, and some of them have noticed two distinct kinds in the one bed—one of them a very poor bearer. The other mostly resembled Sweet Rind, which was bearing very well in parts of the district. The discussion indicated that the local tendency is to go back to the planting of Lisbon.

There was an attendance of fifteen members at the meeting held on 24th April. After the general business had been transacted, a discussion took place on compulsory winter spraying for San José scale and woolly aphis. A letter had been received from another district, asking for co-operation in this direction, and after a general discussion it was decided that as Glenorie district was not suitable for apple growing, the subject could be better dealt with at a conference.

A pruning demonstration under the auspices of this branch was conducted by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 5th May, when there was a splendid attendance of members and others. A hearty vote of thanks was accorded Mr. Brereton for his very interesting demonstration.

At the usual monthly meeting on 29th May, a general discussion took place on the pruning demonstration, and a very interesting and profitable evening was spent.

**Henty.**

A meeting was held on 1st May for the purpose of re-forming this branch, and operations were re-started, with every prospect of a useful career. The office-bearers elected were:—Chairman, Mr. A. P. Haberecht; Vice-chairman, Messrs. R. O. Eulenstein and S. Lavis; Hon. Secretary and Treasurer, Mr. F. H. Schultz.

**Inverell.**

The monthly meeting was held on 30th April, when a paper by Mr. W. R. Fry was read, his subject being the hydro-electric scheme for the north-west districts. The heavy losses of the past four months were pointed out, and the possibilities of insurance of fodder where irrigation was practised. Attention was particularly directed to the transformation effected on the Murrumbidgee Irrigation Areas. A great deal of information was afforded on the possibilities of certain crops becoming established in the district, and a number of questions were answered.

**Kellyville.**

A meeting was held on 5th June, when ordinary business was transacted.

**Lidcombe.**

Mr. R. N. Makin, Inspector of Agriculture, gave a lecture on leguminous vegetables on 3rd May. He stated that, having noticed some private experiments in the coastal districts with peas and beans, he was of the opinion that many of the varieties now grown might be bettered by saving seed from selected strains, and also that the introduction of new varieties of high-yielding capacity could be carried out with advantage. Growers were advised to test in a small way varieties that were recommended, as against those that are now generally grown. The cultivation, manuring, and diseases of leguminous crops were all dealt with, and numerous questions upon diseases were answered.

At a meeting on 17th May, thirty-seven members being present, Mr. Pinn, Inspector of Agriculture, delivered a lecture on potatoes. He dealt with suitable situation and soil, variety, method of choosing seed, general cultivation, and diseases. A number of questions were asked and answered.

### Lower Portland.

At the monthly meeting on 8th April, the principal business was the appointment of judges for the show. It was also decided to stage an exhibit at the Hawkesbury show, and on account of the expense involved it was decided to hold a concert and social to raise funds for the purpose.

The secretary reports that the show held on 4th May was a success in regard to the exhibits, and also financially. The judges praised the exhibits, and stated they would be hard to beat in any other centre in New South Wales for quality and size.

The exhibit staged at the Hawkesbury show was awarded first prize, getting 750 points out of 1,000. This is the second time in succession that the branch has gained first prize at this show.

At the monthly meeting on 7th June, it was decided to have a social evening at an early date, and the annual reunion on 30th July. Arrangements have been made for the pruning demonstration to be conducted by Mr. Brereton, Assistant Fruit Expert, on 15th July.

### Milbrulong.

The usual monthly meeting was held on 2nd April, being attended by forty-nine members.

It was agreed to hold a meeting for the purpose of advancing the cause of co-operative buying. The rules drawn up for the co-operative association were adopted, as also were the articles of association.

A discussion on wheat sowing followed. Pickling, smut, rust and methods of sowing were the chief points discussed. The question arose, "What is the best method of combating flag smut?"

Departmental Note.—Mr. C. O. Hamblin, Assistant Biologist, remarks that the spores of flag smut (the fine black dusty matter which is observable on crushing a leaf of an infected wheat plant) can reach the wheat plant in two ways:—

(*a*) by the soil being well supplied with them;
(*b*) by adhering to the seed grain.

If the paddocks have not previously been badly infected with flag smut, then the pickling process resorted to to avoid infection by stinking smut or bunt has also a cleaning value for flag smut. If, however, paddocks have been badly infested with flag smut in the previous season, pickling has little or no effect.

If possible, a rotation crop is desirable to starve the fungus out. Normally the spore germinates about sowing time, when the conditions of moisture and temperature are favourable to it, so that if the young fungus does not then come into contact with a young wheat plant it dies. If wheat must follow wheat, then the land should be ploughed and worked as soon after the harvest as possible. The moisture conserved may then result in germination of the flag smut prior to the sowing. In such a case the use of a variety that could be sown late would be an advantage. If stubble from a badly "flag-smutted" crop is not burnt off, a large number of spores drop into the soil.

Sowing in a dry seed-bed will usually favour the disease, for the reason that, if the soil contains ungerminated spores, the seed and spores will lie together until rain comes, and then, germinating together, the fungus will have every chance of surviving.

It is important also to note that horses and cattle fed on diseased hay have been shown to pass the spores uninjured. They are then capable of germination; so that flag smut may be spread from paddock to paddock in that way.

It seems that approved good farming methods—rotation of crops, fallow, early preparation of the seed-bed, conservation of soil moisture, and pickling—are also our best methods of combating flag smut. Thorough burning of diseased stubble is also very important.

At a meeting on 3rd May, a discussion took place on the operation of castration, it being stated by individual members that they had used clamps for the extraction of the testicles with great success.

**Moss Vale.**

On 23rd April, Mr. James Hadlington, Poultry Expert, delivered a lecture under the auspices of this branch ; it was attended by twenty-four members and a number of visitors. The lecturer indicated the right stamp of birds to select for breeding purposes, the proper class of eggs to set, and the general management necessary for raising strong healthy stock, fully explaining the whole in a thoroughly practical manner. He was asked many questions as to what he considered the most suitable breed for the district, and in reply he stated that in his opinion the Black or Buff Orpington should answer all requirements, although as a "hard-doer" the Rhode Island Red was hard to beat. Whatever breed was selected, Mr. Hadlington strongly advised early hatching to ensure strong vigorous stock.

On the following morning, Mr. Hadlington visited a couple of new farms, and gave their owners some very valuable advice.

The monthly meeting was held on 7th June, when general business was transacted.

**Mount Keira.**

The usual monthly meeting was held on 2nd June, when Mr. Ramsay Principal Assistant Chemist, delivered a lecture on manures, dealing at some length with the different kinds. The objects of manuring, the conditions necessary, composition of manures, price, quantity to be used, and the source of our manure supply were all covered. The lecturer answered numerous questions, and it was generally felt that the lecture was highly instructive, and of the greatest benefit to those engaged in any class of agriculture.

**Orchard Hills.**

A meeting of this branch was held on 3rd May, there being a good attendance of members. After the general business had been disposed of, a discussion took place on the pruning demonstration conducted by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 27th April. This demonstration had been much appreciated by all who witnessed it, and the discussion deepened its impressions.

**Springside.**

The annual meeting of members was held on 4th May, when the office-bearers for the ensuing twelve months were elected, as follows :—Chairman, Mr. John Selwood; Vice-chairmen, Messrs. G. Naylor and D. Quinlan; Hon. Secretary, Mr. W. P. Scarr; Assistant Secretary and Treasurer, Mr. W. Giles; Publicity officer and Librarian, Mr. J. Britt.

During the year, ten successful meetings were held, the average attendance for each meeting being twenty-two. Six lectures and demonstrations were given by departmental officers, and a demonstration of explosives by Mr. Crossley. The financial statement showed a credit balance of £6 3s.

At the monthly meeting on 1st June, arrangements were made for a pruning demonstration to be given shortly by Mr. Meier, Orchardist at Bathurst Experiment Farm, and also for the visit of Mr. C. C. Crane, Organising Inspector of the Agricultural Bureau.

**Stratford.**

A very successful pruning demonstration was given by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 3rd June, some twenty members being present. The usual monthly meeting had to be abandoned owing to wet weather.

### Tallawang.

The annual meeting was held on 1st May, but on account of farmers being busy sowing wheat, and the fact that the night was a bitterly cold one, the attendance was only moderate.

Office-bearers were elected for the ensuing year, Mr. A. Robinson and Mr. H. W. Graham being re-elected as Chairman and Hon. Secretary respectively. Matters of local interest were discussed. The reading circle was rearranged, a box of books having been received from the Public Library in Sydney.

### Thyra-Bunaloo.

At the meeting held on 8th May, after the general business had been disposed of, a useful paper on the blow-fly pest was read by Mr. Robert Smith. An interesting discussion followed.

### Tingha.

The monthly meeting was held on 1st May, when a satisfactory report on the recent exhibition was tabled, and certain decisions were arrived at for the next fixture of the kind.

A paper was read by Mr. G. W. Browning on the subject of potato growing, covering the choice of seed, varieties, manuring, cultivation, diseases, &c. Useful information was given on all points.

Departmental Note.—The manure now recommended by the Department in the Northern Tableland district is 2 cwt. superphosphate and ½ cwt. sulphate or muriate of potash on sandy soils, or 2 cwt. superphosphate alone on clay soils.

### Toronto.

The monthly meeting was held on 1st June. It was decided to ask the Department for a lecture on grasses by Mr. E. Breakwell, Agrostologist.

About fifty persons attended the pruning demonstration conducted by Mr. Brereton, Assistant Fruit Expert. It was very much appreciated and was attended by about fifteen senior boys from Toronto school.

Mr. L. Owen gave an interesting discourse on sprays and spraying, for which he was accorded a vote of thanks.

### Wellington.

At a meeting on 4th May, a paper was read by Mr. J. Cook on the growing of onions. Much useful information was given in the paper, especially as to the preparation of the seed-bed and sowing of the seed.

### Windsor.

At the April meeting, general business was transacted. The sugar account showed a credit balance of £4 7s. 7d.

The May meeting was well attended. Among other things discussed were the questions asked in the *Agricultural Gazette* for May on the subject of potatoes, these leading to a discussion of the "piebald" and "blue" types of Manhattan.

Departmental Note.—The "piebald" is the accepted type of Manhattan, but of late years the "blue" type has also been fairly extensively grown. It is not yet certain whether the latter is the result of a sport or the introduction of another variety resembling Manhattan.

### Woonona.

A well attended meeting was held on 11th May, when a good deal of local business was dealt with. It was the unanimous opinion of members that a larger hall for the shows is now necessary.

### Yarramalong.

At the usual monthly meeting on 5th May, general business was transacted, and the report on the maize trials was received.

A pruning demonstration was conducted by Mr. W. le Gay Brereton, Assistant Fruit Expert, on 26th May. There was a good attendance of fruitgrowers, and also the teacher and the elder boys of the public school. As well as giving a practical demonstration, Mr. Brereton lectured and answered many questions. He pruned nectarine, peach, apricot, plum and pear trees in various stages of growth.

## AGRICULTURAL SOCIETIES' SHOWS.

**Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.**

### 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Corowa P., A., and H. Society | J. D. Fraser | Aug. 17, 18 |
| Parkes P., A., and H. Association | G. W. Seaborn | ,, 17, 18 |
| Forbes P., A., and H. Association | E. A. Austen | ,, 23, 24 |
| Murrumbidgee P. and A. Association (Wagga) | A. F. D. White | ,, 24, 25, 26 |
| Lockhart A. and P. Society | E. D. Arnold | ,, 31, and Sept. 1 |
| Albury and Border P., A., and H. Society | A. G. Young | Sept. 7, 8, 9 |
| Young P. and A. Association | T. A. Tester | ,, 7, 8, 9 |
| Cowra P., A., and H. Association | E. P. Todhunter | ,, 14, 15 |
| Ganmain A. and P. Association | T. S. Henderson | ,, 14, 15 |
| Cootamundra A., P., H., and I. Association | N. Gardner | ,, 15, 16 |
| Northern A. Society (Singleton) | J. T. McMahon | ,, 15, 16, 17 |
| Narrandera P. and A. Association | W. H. Canton | ,, 21, 22 |
| Temora P., A., H., and I. Association | A. D. Ness | ,, 21, 22, 23 |
| Holbrook P., A., and H. Society | J. S. Stewart | ,, 23, 24 |
| Junee P., A., and I. Association | T. C. Humphreys | ,, 28, 29 |
| Deniliquin P. and A. Society | P. Fagan | ,, 29 |

### 1921.

| Society. | Secretary. | Date. |
|---|---|---|
| Kiama A. Society | G. A. Somerville | Jan. 25, 26 |
| Cobargo A., P., and H. Society | T. Kennelly | Feb. 9, 10 |
| Ulladulla A. and H. Association (Milton) | R. F. Cork | ,, 16, 17 |
| Guyra P., A., and H. Association | P. N. Stevenson | ,, 16, 17, 18 |
| Dapto A. and H. Society | F. James | ,, 18, 19 |
| Yanco Irrigation Area Agricultural Society | R. Tribe | ,, 22, 23 |
| Newcastle A., H., and I. Association | E. J. Dann | ,, 24, 25, 26 |
| Glen Innes P. and A. Society | Geo. A. Priest | March 8, 9, 10 |
| Tumbarumba and Upper Murray P. and A. Society | E. C. Cunningham | ,, 9, 10 |
| Taralga A., P., and H. Association | J. J. Kearney | ,, 10, 11 |
| Upper Hunter P. and A. Association | R. C. Sawkins | ,, 16, 17 |
| Royal Agricultural Society of N.S.W. | H. M. Somer | ,, 21 to 30 |

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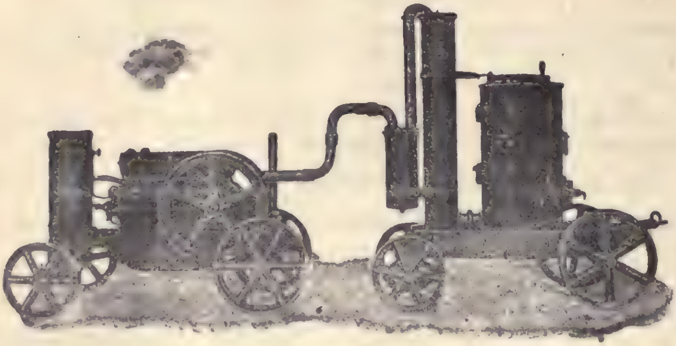

VOL. XXXI. PART 8. AUGUST 2, 1920.

*Agricultural Gazette of New South Wales.*

# The Grain Wheats for Central Western Districts.

## FARMERS' EXPERIMENT PLOTS, 1909 TO 1919, SUMMARISED.

J. E. SYME, Inspector of Agriculture.

IN the following tables an effort has been made to summarise the results on the wheat plots in central-western districts for the last ten years. This has been done by grouping the plots together in localities, and averaging all the results obtained within the limits of each locality. For instance, in the Molong district, farmers' experiment plots have been conducted in different years at Cumnock, Manildra, Eurimbla, and Gregra; and as the conditions are approximately similar, and the results instructive to a considerable area devoted to wheat growing, the yields of each variety tried during the ten years have been brought together and averaged, in order that the best variety for those conditions may be ascertained. In all, Federation has been grown nine times, and other varieties differing numbers of times, and by averaging the results from each variety some idea has been obtained of the relative value of each for the Molong district.

The method has been elaborated so as to cover five principal centres in the central west, viz., Molong (already mentioned), Parkes (including results obtained on plots at Parkes, Cookamidgera, Nelungaloo, Coradgery, Alectown, and Tichborne), Wellington (including results obtained on plots at Maryvale, Wellington, and Geurie), Gilgandra (including results obtained on plots at Gilgandra, Collie, and Armatree), and Bogan Gate (including results obtained on plots at Bogan Gate, Botfield, Tullamore, Ootha, Gunningbland, Condobolin, and Trundle).

As all the wheats have not been grown every year, a standard wheat (Federation) has been accepted as a basis of comparison. That popular variety was more extensively grown than any other, and has done extremely well in each of the five localities, so that it is a fair medium for comparison. The method by which the tables are compiled should perhaps be explained. In the Parkes district, for instance, Federation was grown fourteen times, and its average on all plots was 22 bushels 2 lb.; but Hard Federation was only grown nine times, and its average of 23 bushels 8 lb. is not strictly comparable with the Federation average. The method adopted has been therefore to average the yields of Federation that were obtained contemporaneously with those of Hard Federation; this enables the Hard Federation average of 23 bushels 8 lb. to be compared with the average yield of Federation on the same plots, viz., 22 bushels 33 lb. When the same is done with Rymer (which was tried eight times), and with other varieties, a basis is provided for the comparison of each variety, not only with Federation, but with every other. Finally, the presentation of each variety,

on a percentage basis, with its "comparable average" of Federation as 100, simplifies the comparison. These percentages, of course, should be read with one eye fixed on the number of trials.

Many wheats grown by farmers give good yields in one season and poor in others, but by studying the tables it will be found which are more profitable than others, and which (by reason of several trials) have most claim to attention. In this way six or eight wheats can be mentioned for each district as those which should be grown, while others can be recognised as worth further trial, though not grown long enough to enable absolute comparison to be made.

It is recognised that a farmer is in a measure dependent on the conditions as to when he can sow his seed, and to meet this circumstance a table is added in which the varieties that have done best in each district are arranged in relation to maturity under the headings "late wheats," "mid-season wheats," and "early wheats." It might be remembered once more that that classification does not refer to the sowing season, but to the period of maturity. Hence "late wheats" must be sown early in the sowing season, and "early wheats" late in the sowing season.

*Molong–Cumnock–Eurimbla.*

| Variety. | No. of trials. | Average yield. | | Average yield of Federation on same plots. | | Percentage yield. |
|---|---|---|---|---|---|---|
| | | bus. | lb. | bus. | lb. | |
| Bunyip ... ... ... | 2 | 18 | 43 | 16 | 28 | 113·6 |
| Roseworthy ... ... | 1 | 34 | 5 | 29 | 21 | 110·4 |
| Yandilla King ... ... | 3 | 21 | 2 | 19 | 30 | 107·9 |
| Marshall's No. 3 ... ... | 5 | 19 | 31 | 18 | 15 | 106·9 |
| Federation... ... ... | 9 | 21 | 0 | ......... | | ...... |
| Cleveland ... ... ... | 2 | 26 | 9 | 26 | 9 | 100 |
| Rymer ... ... ... | 5 | 21 | 49 | 19 | 35 | 98·7 |
| Canberra ... ... ... | 5 | 25 | 5 | 22 | 38 | 97·8 |
| Improved Steinwedel ... | 2 | 33 | 4 | 33 | 4 | 97·0 |
| Hard Federation ... ... | 5 | 24 | 28 | 22 | 12 | 95·4 |
| Bomen ... ... ... | 3 | 22 | 59 | 19 | 7 | 93·4 |
| King's Early ... ... | 1 | 27 | 22 | 27 | 22 | 93·2 |
| Warden ... ... ... | 2 | 20 | 51 | 20 | 51 | 91·9 |
| Currawa ... ... ... | 1 | 26 | 50 | 26 | 50 | 91·4 |
| Florence ... ... ... | 2 | 19 | 51 | 16 | 44 | 90·9 |
| Bobs ... ... ... | 2 | 17 | 23 | 19 | 22 | 90·0 |
| Major ... ... ... | 3 | 22 | 50 | 22 | 50 | 87·8 |
| Clarendon ... ... ... | 3 | 17 | 26 | 15 | 27 | 87·0 |

The following varieties were also tried, giving the percentages indicated:—Penny, 85·8; Thew, 81·9; Comeback, 76·4; Warren, 71·4; Firbank, 66·9.

*Parkes.*

| Variety. | No. of trials. | Average yield | | Average yield of Federation on same plots. | | Percentage yield. |
|---|---|---|---|---|---|---|
| | | bus. | lb. | bus. | lb. | |
| Canberra ... ... ... | 9 | 25 | 39 | 22 | 33 | 113·7 |
| Clarendon ... ... ... | 1 | 12 | 24 | 11 | 40 | 106·3 |
| Hard Federation .. ... | 9 | 23 | 8 | 22 | 33 | 102·5 |
| Federation ... ... | 14 | 22 | 2 | ......... | | ... ... |
| Rymer ... ... ... | 8 | 23 | 39 | 24 | 9 | 97·2 |
| Cedar ... ... ... | 1 | 16 | 54 | 17 | 35 | 96·1 |
| Improved Steinwedel ... | 8 | 19 | 54 | 20 | 51 | 95·4 |
| Bayah .. ... ... | 2 | 19 | 25 | 20 | 26 | 95·0 |
| King's Early ... ... | 2 | 31 | 2 | 33 | 15 | 93·3 |
| Yandilla King ... ... | 8 | 21 | 27 | 23 | 17 | 91·4 |
| Bobs ... ... ... | 2 | 21 | 25 | 23 | 29 | 91·2 |
| Marshall's No. 3 ... ... | 8 | 22 | 23 | 24 | 23 | 91·1 |
| Warden ... ... ... | 4 | 12 | 34 | 13 | 47 | 91·1 |
| Florence ... ... ... | 5 | 20 | 13 | 22 | 18 | 90·6 |
| Cleveland ... ... ... | 1 | 15 | 20 | 17 | 18 | 88·6 |
| Currawa ... ... ... | 1 | 10 | 8 | 11 | 40 | 86·8 |
| Bomen ... ... ... | 5 | 19 | 19 | 22 | 37 | 85·4 |
| Warren ... ... ... | 3 | 22 | 44 | 26 | 52 | 84·6 |

The following varieties were also tried, giving the percentages indicated :—Penny, 81·7; Thew, 80·7; Major, 78·7; Comeback, 77·8; Bunyip, 75·9; Cowra No. 15, 70·8; Firbank, 69·5; Cowra No. 19, 68·7; Roseworthy, 68·4.

*Wellington.*

| Variety. | No. of trials. | Average yield. | | Average yield of Federation on same plots. | | Percentage yield. |
|---|---|---|---|---|---|---|
| | | bus. | lb. | bus. | lb. | |
| Marshall's No. 3 ... ... | 4 | 19 | 45 | 18 | 30 | 107·6 |
| Major ... ... ... | 3 | 26 | 36 | 25 | 26 | 104·5 |
| Commonwealth ... ... | 2 | 24 | 20 | 24 | 11 | 100·6 |
| Federation ... ... | 12 | 25 | 3 | ......... | | ..... |
| Bomen ... ... ... | 3 | 25 | 58 | 28 | 52 | 89·9 |
| Warden ... ... ... | 2 | 22 | 31 | 25 | 2 | 89·9 |
| Roseworthy ... ... | 1 | 23 | 29 | 26 | 15 | 89·4 |
| Hard Federation ... ... | 5 | 21 | 58 | 24 | 33 | 89·4 |
| Canberra ... ... ... | 4 | 19 | 39 | 22 | 55 | 85·8 |
| Bunge ... ... ... | 1 | 23 | 12 | 27 | 9 | 85·4 |
| Comeback .. ... ... | 5 | 16 | 29 | 23 | 25 | 84·6 |
| Dart's Imperial ... ... | 3 | 22 | 9 | 26 | 12 | 84·5 |
| Yandilla King ... ... | 6 | 22 | 50 | 27 | 21 | 83·4 |
| Zealand ... ... ... | 2 | 16 | 46 | 20 | 16 | 82·7 |
| Rymer ... ... ... | 6 | 21 | 16 | 25 | 52 | 82·2 |
| Cedar ... ... .. | 3 | 16 | 24 | 20 | 23 | 80·4 |

The following varieties were also tried, giving the percentages indicated :—Thew, 76·8; Bayah, 76·8; Red Wings, 75·4; Bobs, 72·9; Warren, 72·8; Moira, 71·7; Bunyip, 69·8; Cleveland, 65·5; Firbank, 61·7; Billy Hughes, 59·1; Florence, 56·6; Marquis, 55·3.

*Gilgandra.*

| Variety. | No. of trials. | Average yield. | | Average yield of Federation on same plots. | | Percentage yield. |
|---|---|---|---|---|---|---|
| | | bus. | lb. | bus. | lb. | |
| Moira ... ... ... | 1 | 15 | 40 | 8 | 13 | 190·6 |
| Currawa ... ... ... | 4 | 20 | 48 | 16 | 8 | 128·9 |
| Hard Federation ... ... | 5 | 21 | 2 | 18 | 41 | 112·5 |
| Canberra ... ... ... | 7 | 19 | 50 | 17 | 50 | 111·2 |
| Improved Steinwedel ... | 2 | 23 | 58 | 21 | 33 | 111·2 |
| Major ... ... ... | 3 | 21 | 24 | 19 | 27 | 110·02 |
| Marshall's No. 3 ... ... | 5 | 25 | 59 | 25 | 15 | 102·9 |
| Warren ... ... ... | 4 | 16 | 58 | 16 | 29 | 102·9 |
| Rymer ... ... ... | 7 | 22 | 2 | 22 | 1 | 100·07 |
| Federation ... ... | 13 | 17 | 14 | ...... | | ...... |
| Yandilla King ... ... | 7 | 14 | 17 | 14 | 18 | 99·8 |
| Bomen ... ... ... | 3 | 15 | 10 | 15 | 27 | 98·1 |
| Bayah ... ... ... | 3 | 14 | 56 | 15 | 18 | 97·6 |
| Bunge ... ... ... | 1 | 25 | 33 | 27 | 4 | 94·3 |
| Nardoo ... ... ... | 1 | 25 | 19 | 27 | 4 | 93·5 |
| Bunyip ... ... ... | 8 | 15 | 15 | 16 | 34 | 92·0 |
| Commonwealth ... ... | 1 | 16 | 23 | 17 | 57 | 91·2 |
| Firbank ... ... ... | 4 | 18 | 13 | 20 | 6 | 90·6 |
| Cleveland ... ... ... | 3 | 20 | 47 | 23 | 15 | 89·4 |
| Comeback ... ... ... | 5 | 14 | 3 | 15 | 56 | 88·1 |
| Cedar ... ... ... | 2 | 8 | 26 | 9 | 38 | 87·5 |

The following varieties were also tried, giving the percentages indicated :—Clarendon, 86·5 ; Penny, 80·8 ; Florence, 79·9 ; Warden, 79·3 ; Bobs, 78·8 ; Thew, 70·7 ; Sunset, 70·2 ; Marquis, 60·5.

*Bogan Gate—Trundle—Condobolin.*

| Variety. | No. of trials. | Average yield. | | Average Yield of Federation on same plots. | | Percentage yield. |
|---|---|---|---|---|---|---|
| | | bus. | lb. | bus. | lb. | |
| Allora Spring ... ... | 1 | 15 | 28 | 9 | 17 | 166·6 |
| Harriet ... ... ... | 1 | 14 | 35 | 9 | 17 | 157·0 |
| Gluyas Early .. ... | 2 | 10 | 42 | 7 | 45 | 138·0 |
| Commonwealth ... ... | 1 | 8 | 12 | 7 | 2 | 116·5 |
| Marshall's No. 3 ... ... | 8 | 11 | 26 | 9 | 58 | 114·7 |
| Bomen ... ... ... | 2 | 9 | 11 | 8 | 8 | 112·9 |
| Sunset ... ... ... | 3 | 14 | 7 | 12 | 46 | 110·9 |
| Cedar ... ... ... | 2 | 16 | 26 | 14 | 50 | 110·7 |
| Canberra ... ... .. | 4 | 18 | 3 | 17 | 15 | 104·6 |
| Improved Steinwedel .. | 4 | 16 | 50 | 16 | 9 | 104·2 |
| Federation ... ... | 16 | 12 | 33 | ... | | ... |
| Rymer ... ... ... | 11 | 9 | 33 | 9 | 47 | 97·6 |
| King's Red ... ... | 1 | 12 | 37 | 13 | 5 | 95·9 |
| Clarendon ... ... ... | 1 | 12 | 35 | 13 | 5 | 95·7 |
| Yandilla King ... ... | 3 | 12 | 21 | 12 | 54 | 95·7 |
| King's Early ... ... | 4 | 18 | 32 | 19 | 43 | 93·9 |
| Bunyip ... ... ... | 10 | 11 | 9 | 11 | 56 | 93·4 |
| Warren ... ... .. | 4 | 15 | 5 | 16 | 17 | 92·6 |
| Hard Federation ... ... | 5 | 14 | 3 | 15 | 39 | 89·7 |
| Cleveland ... ... ... | 1 | 12 | 44 | 14 | 15 | 89·3 |
| Roseworthy ... ... | 1 | 11 | 21 | 13 | 5 | 87·5 |
| Comeback ... ... ... | 5 | 9 | 15 | 10 | 39 | 86·8 |
| Bayah ... ... ... | 3 | 14 | 11 | 16 | 29 | 86·0 |

The following varieties were also tried, giving the percentages indicated :—Florence, 82·8 ; Zealand, 82·5 ; Bobs, 82·0 ; Firbank, 81·2 ; Thew, 70·6 ; Marquis, 47·1.

TABLE showing best Yielding Varieties in each District.

| | Molong-Cumnock-Eurimbla. | Per cent. | Parkes. | Per cent. | Wellington. | Per cent. | Gilgandra. | Per cent. | Bogan Gate-Trundle-Condobolin | Per cent. |
|---|---|---|---|---|---|---|---|---|---|---|
| Late Wheats. | Yandilla King | 107·9 | | | | | | | Yandilla King | 95·7 |
| | Marshall's No. 3 | 106·9 | Marshall's No. 3 | 91·1 | Marshall's No. 3 | 107·6 | Marshall's No. 3 | 102·9 | Marshall's No. 3 | 114·7 |
| | | | | | Major | 104·6 | Major | 110·02 | | |
| | Cleveland | 100 | | | | | | | | |
| | | | Rymer | 97·2 | | | Rymer | 100·07 | Rymer | 97·6 |
| Mid-season Wheats. | | | | | | | Currawa | 128·9 | | |
| | Federation | 100 | Federation | 100 | Federation | 100 | Federation | 100 | Federation | 100 |
| | Bomen | 93·4 | | | Bomen | 89·9 | | | | |
| | | | | | | | Warren | 102·9 | Warren | 92·6 |
| | | | Warden | 91·1 | | | | | | |
| Early Wheats. | Canberra | 97·8 | Canberra | 113·7 | Canberra | 85·8 | Canberra | 111·2 | Canberra | 104·6 |
| | Hard Federation | 95·4 | Hard Federation | 102·5 | Hard Federation | 89·4 | Hard Federation | 112·5 | | |
| | | | Improved Steinwedel | 95·4 | | | | | Improved Steinwedel | 104·2 |
| | | | | | | | | | Bunyip | 93·4 |
| | | | | | | | | | Sunset | 110·9 |
| Worth further Trial | Bunyip | 113·6 | Clarendon | 106·3 | Commonwealth | 100·6 | Moira | 190·0 | | |
| | Roseworthy | 110·4 | King's Early | 93·3 | Warden | 89·9 | Improved Steinwedel | 111·2 | Allora Spring | 166·6 |
| | Improved Steinwedel | 97·0 | | | | | | | Harriet | 157·0 |
| | King's Early | 93·2 | | | | | | | Gluyas Early | 138·0 |
| | | | | | | | | | Commonwealth | 116·5 |
| | | | | | | | | | Bomen | 112·9 |
| | | | | | | | | | Cedar | 110·7 |

A study of the foregoing figures cannot but direct attention to three wheats as of outstanding value. Averaging the yields on all plots, and again accepting Federation as 100, Marshall's No. 3 (a late variety) has a percentage in the central west of 105·1 per cent., and Canberra (an early variety) 107·4 per cent. Hard Federation, another early wheat, must also be close up, having a good percentage in four out of the five localities; the locality in which it does not figure well, strangely enough, is one of the driest, and therefore usually suitable to an early wheat, while Marshall's No. 3 (one of the slowest maturing of all) stands at 114 per cent.

## To Store Wheat for Seed.

It is possible to keep wheat to be used as stock feed for a considerable time providing (1) the wheat is free from weevil and perfectly dry, and (2) the pit in which it is to be stored is also absolutely dry. There is a limit, of course, to the time for which such wheat would be suitable for seed purposes.

It is claimed that if dry lime is thickly sprinkled through sound wheat as it is bagged, and a perfectly dry barn is used for storing, wheat will be weevil-proof and will keep indefinitely. The lime can easily be blown out as the wheat is used.—W. W. Froggatt.

## Sudan Grass in the North-west.

To ensure germination of Sudan grass in the north-west, roll after sowing. In drier districts best results are obtained by sowing in drills 28 inches apart, and using the scuffler when possible. When some stems are about 2 feet high cut for feed. This will induce stooling, and produce an even-headed crop. Seed may easily be harvested with the harvester, eliminating the air blast, and cleaning may then be done with a winnower or by hand.—H. Bartlett, Assistant Inspector of Agriculture.

## Farm Book-keeping to the Front.

It is not difficult to understand why farm book-keeping has been neglected in the past. The term book-keeping itself reeks of the town, and the office, and indoor work. The farming community has been proud of its isolation and distinctiveness from the town and suspicious of all that is connoted by factories, ledgers and the like. . . This state of affairs, however, is an old and closed chapter. All the circumstances are altered. Farming has not escaped the rapid flux and change which has been observable for a number of years, and has been accelerated during the last five. The increasing cost of all farming expenses; the pressure of income tax assessments; increasing competition; the development of transport, tending to bring town and country together—all of these combine to force the question of farm book-keeping to the front.—H. G. Howell, in the *Journal of the Ministry of Agriculture*, London.

# Farmers' Experiment Plots.

## Potato Experiments, 1919–20.

### Central Coast.

J. M. PITT, Assistant Inspector of Agriculture.

The following farmers co-operated with the Department in carrying out variety and manurial trials with potatoes during 1919-20:—

J. G. Ward, Sherwood, Macleay River.
Felix Kemp, West Kempsey, Macleay River.
J. W. Smith, "Hazeldean," Wauchope, Hastings River.
Collins Brothers, Comboyne.
J. C. Duff, "Somerset," Mt. George, Manning River.
Thos. Hoad, Mt. George, Manning River.
Alex. Smith & Atkins Bros., Bandon Grove, Williams River.
M. Smith, "Bona Vista," Paterson, Paterson River.
J. T. Perrett, Miller's Forest, Hunter River.

With one or two exceptions the yields were higher than those of last year, and it is doubtful whether the crop of 16 tons per acre, taken from the Mount George plots, has previously been exceeded on the central coast.

Mr. J. C. Duff was narrowly defeated for the first prize in the competition for the highest yielding plot in the district, inaugurated by the Manning River District Agricultural and Horticultural Association, after having gained a similar place last year.

Messrs. Collins Bros., of the Comboyne, won first and second honours respectively at the Manning River District and the Hastings River District Shows, with potatoes grown on the experiment plots.

The season for the first couple of months after sowing was dry and frosty, but from the middle of October onward ample rain fell. Much of the success of the plots, however, was due to the efforts of the farmers in preparing good, moisture-holding seed-beds. It was particularly noticeable, on the contrary, that where cultural methods had been delayed until the spring, such as at West Kempsey, very little moisture was conserved, and the yields were poor. Sown early in a good moist seed-bed, Up-to-date, an early maturing variety, usually outyields any other grown on the coast, but at West Kempsey, where the plots were sown late in comparatively dry land, that variety failed altogether, the rains that fell in November being too late to be of benefit.

The season was responsible for an extraordinary amount of top growth, in some places over 3 feet in height. There were individual cases of attacks from ladybird and Rutherglen bug, but fungus pests were entirely absent.

The seed of Vermont, Sussex, Early Rose and Manhattan was inferior, and of the others, such as Factor, Up-to-date and Carman, many were identical. Good seed was scarce last season, and there seems little hope of more accurate results being obtained from experiments until reliable seed, such as a Government potato farm would provide, becomes available.

The following table shows the distribution of the rainfall over the growing period. Where the sowings had taken place in good moist seed-beds, showers were of assistance, but where the seed-bed was comparatively dry, falls of less than a half or three-quarters of an inch were not of much use:—

| Month. | Sherwood. | West Kempsey. | Wauchope. | Mount George. | Comboyne. | Bandon Grove. | Paterson. | Miller's Forest. |
|---|---|---|---|---|---|---|---|---|
| 1919. | Points. | Points. | Points. | Points. | Points. | Not available. | Points. | Points. |
| August ... ... | Nil. | Nil. | 3 | 21 | ...... | | ...... | ...... |
| September .. | 15 | 14 | 72 | 190 | 30 | | 216 | 140* |
| October ... ... | 107 | 236 | 262 | 215 | 434 | | 330 | 207 |
| November ... | 338 | 229 | 131 | 199 | 479 | | 479 | 128 |
| December ... | 287 | 320 | 160 | 507 | 340 | | 340 | 331 |
| 1920. | | | | | | | | |
| January... ... | 100* | 120* | ...... | 110* | 876 | | 280 | 71* |
| Total ... | 847 | 919 | 628 | 1,242 | 2,159 | ...... | 1645 | 877 |

* Signifies part of month.

## Cultural Notes.

*Sherwood.*—Soil, moderately rich; loamy. The manurial section had been previously cropped with potatoes in 1918, followed immediately by vetches in 1919, which were grazed off, the residue being ploughed under in July. The variety trial section had grown maize for a number of years. Land ploughed in July and fallowed until just previous to sowing. Preparatory cultural methods conserved little moisture. Potatoes planted on 26th August in a seed-bed, none too moist; germination patchy; harrowed after majority of plants up; cultivated twice and hilled; showers in October assisted growth; good rains fell in November. Rutherglen bug did damage in Novembe t a section of the crop.

*West Kempsey.*—Soil, stiff heavy loam; cropped for a number of years previously with maize. Land remained hard and untouched until August, when it was ploughed, rolled, and harrowed twice. Left fallow for a month; again ploughed, harrowed, scarified, harrowed and rolled. Although in excellent tilth for sowing, on 18th September the soil was dry. It was unfortunate that the heavy autumn rains were not conserved, owing to ploughing being too late. Seed covered with a maize hiller—a very useful implement for the purpose; germination fairly good; harrowed, cultivated twice, and hilled; good growth of foliage, but of that dark-green colour that indicates lack of moisture. Late rain helped the late-maturing varieties, but the tubers were abnormal with second growth.

*Wauchope.*—Soil, stiff clayey loam; previously cropped with peas in the winter of 1918 maize in the summer of 1918–19, and peas in the winter of 1919; residues ploughed under in July. Seed-bed in good order, but a

considerable drying-out took place on the day of planting owing to high westerly winds. Seed used mostly inferior, especially that of Manhattan, Vermont, Sussex, and Early Rose; covered with cultivator, run twice up the centres, and harrowed. Up-to-date germinated well, others patchy; harrowed, cultivated twice, and hilled. The only rain of use fell in October. Ladybirds were prevalent in November.

*Mt. George.*—Soil, rather stiff rich loam; previously cropped with lucerne in 1916, maize in 1917–18, and maize in 1918–19. Ploughed after removal of the crop in June. Harrowed twice and rolled. Ploughed and harrowed previous to sowing. Land in excellent moist condition for planting on 20th August. Sets covered with cultivator twice up centre of drills, then harrowed. Vermont seed not good; germination throughout good. Heavy frosts hit some early foliage, but without serious damage. Frosts occurred on 3rd, 9th, 11th, 14th, 16th (heavy), 17th (heavy) and 18th September, and on 23rd October (light). Harrowed twice; cultivated twice and hilled; no lack of moisture throughout growth. Extraordinary top growth. Up-to-date vines became a tangled mass.

*Bandon Grove.*—Soil, rich loamy; previous crop, maize in 1918, followed by barley; ploughed early in July and harrowed; ploughed again in August, harrowed and rolled. Crop ploughed in, 3rd September, in moist, clean seed-bed; germination good; harrowed, cultivated twice, and hilled; excellent growth throughout.

*Paterson.*—Soil, stiff clayey loam; previous crop, maize in 1918 and haricot beans. Land ploughed in May and again in September; harrowed and cultivated, and rolled. Sets ploughed in in rather moist soil on 16th September; left for a while before harrowing; soil rather lumpy. Heavy rain shortly after broke down the clods and nicely covered the sets. Germination good, excepting Vermont and Sussex; harrowed and cultivated twice; hilled. Falls of rain at intervals helped to turn out very good yields.

*Comboyne.*—Soil, deep rich-red volcanic; previous crop, maize. Cultural methods very rough; stalks and rubbish ploughed in in July; rolled; ploughed again in August, harrowed, and rolled. Seed-bed moist, but dirty; sets ploughed in, 23rd September. Germination good; crop harrowed and cultivated, and hilled. Crop became rather dirty owing to heavy rain forcing summer grass and weeds into growth.

*Miller's Forest.*—Soil, stiff clayey loam; previously cropped with lucerne in 1917; broom millet in 1918–19; land ploughed in May, harrowed and rolled; ploughed again previous to sowing, harrowed and rolled. Sets planted on 17th September; covered with cultivator, and then harrowed; germination good; crop harrowed and cultivated twice, and hilled. Although promising well at the outset, a dry spell in November reduced yields. The Hunter is renowned for its dry periods in the spring, especially in November, and sowing early (even late in July) should be encouraged to avoid these dry periods as much as possible.

### New Varieties.

Two new white-skinned varieties were introduced into the plots, viz., Langworthy and Eureka, and both showed considerable promise. The latter matures quite three weeks earlier then any other variety tried. It makes rather sparse top growth and bears all its tubers in a cluster; tubers roundish in shape, with flesh brittle and firm; very uniform in size, almost 100 per cent. being marketable. Eureka should be suitable for early marketing, and for autumn sowings. It is an excellent cooker.

Langworthy is oval and flat; flesh fine grained. It matures about ten days later than Eureka, and yielded extremely well on the only plot on which it was tried. Owing to its immunity from the dreaded "black scab," which is prevalent in the Old Country, it is grown rather extensively there. It should become a popular variety here. Farmers who have tried these varieties for the first time speak very highly of their future.

The following table shows the yields:—

RESULTS of Potato Variety Trials.

Fertilised throughout with 2 cwt. per acre of P7 mixture. Seed sown with 3 feet between rows, and 15 inches between sets in drills.

| Varieties. | Mt. George.* | Sherwood.* | Wauchope.* | Bandon Grove. |
|---|---|---|---|---|
| | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. |
| Up-to-date ... ... | 16 12 2 13 | 8 6 0 22 | 6 18 2 13 | 9 4 1 21 |
| Carman... ... ... | 15 0 2 4 | 8 1 3 26 | ......... | 11 16 3 25 |
| Factor ... ... ... | 15 5 0 13 | 9 9 3 14 | ......... | ......... |
| Queen of the Valley ... | 14 4 3 8 | 10 19 1 10 | ......... | 8 11 1 21 |
| Eureka ... ... ... | 13 3 0 0 | ......... | ......... | ......... |
| Brownell's Beauty ... | 12 2 0 11 | 6 11 0 3 | 3 12 2 18 | 7 19 1 5 |
| Langworthy ... ... | 11 11 2 18 | ......... | ......... | ......... |
| Vermont ... ... | 8 16 3 4 | ......... | ......... | 8 6 3 19 |
| Satisfaction ... ... | 7 9 2 20 | 9 7 1 19 | 3 13 3 14 | 9 0 2 21 |
| Manhattan ... .. | ......... | 5 10 3 26 | ......... | 8 10 2 10 |
| Sussex ... ... ... | ......... | 3 7 1 21 | Failure. | 8 7 3 2 |
| Coronation ... ... | ......... | ......... | 3 7 2 16 | 10 11 1 2 |
| Early Rose ... ... | ......... | ......... | 1 9 3 12 | ......... |

| Varieties. | Paterson. | West Kempsey.* | Comboyne. | Miller's Forest.* |
|---|---|---|---|---|
| | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. |
| Up-to-date ... ... | 9 14 1 24 | Failure. | 5 7 1 0 | 6 3 0 0 |
| Carman... ... ... | 6 5 0 0 | 3 14 1 4 | 5 18 0 6 | ......... |
| Factor ... ... ... | ......... | Failure. | ......... | ......... |
| Queen of the Valley ... | 5 15 3 16 | 5 19 2 16 | 4 17 3 8 | ......... |
| Eureka ... ... ... | 2 15 0 0 | ......... | 3 16 1 18 | ......... |
| Brownell's Beauty ... | 5 0 0 20 | 6 10 1 24 | ......... | ......... |
| Langworthy ... ... | ......... | ......... | ......... | ......... |
| Vermont ... ... | 2 3 0 24 | ......... | ......... | ......... |
| Satisfaction ... ... | 5 17 3 12 | 3 14 3 3 | 3 19 0 18 | 3 19 0 0 |
| Manhattan ... ... | 4 6 1 20 | ......... | 3 2 1 22 | 3 16 1 0 |
| Sussex ... ... ... | 3 16 3 12 | ......... | ......... | ......... |
| Coronation ... ... | 6 9 0 0 | ......... | ......... | ......... |
| Early Rose ... ... | ......... | ......... | ......... | 4 2 2 0 |

* These plots were sown in drills; the others were ploughed in.

RESULTS of Potato Manurial Trials.

| Manures and Mixtures. | Mt. George. | | | | Sherwood. | | | | Wauchope. | | | | Comboyne. | | | | Miller's Forest. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| No Manure .. .. | 12 | 15 | 1 | 11 | 8 | 7 | 3 | 3 | 4 | 4 | 1 | 24 | 1 | 15 | 2 | 6 | 5 | 18 | 2 | 0 |
| 2 cwt. P7 .. .. | 10 | 17 | 2 | 5 | 8 | 6 | 0 | 22 | 6 | 18 | 2 | 13 | 5 | 7 | 1 | 0 | 6 | 3 | 0 | 0 |
| 2 ,, P5 .. .. | 14 | 19 | 0 | 25 | 8 | 15 | 0 | 16 | 4 | 8 | 1 | 16 | 5 | 5 | 2 | 9 | ...... | | | |
| 2 ,, P8 .. .. | 11 | 18 | 3 | 26 | 8 | 1 | 2 | 7 | 7 | 16 | 0 | 18 | 5 | 6 | 2 | 10 | 7 | 1 | 2 | 0 |
| 2 ,, Superphosphate .. | 14 | 13 | 1 | 9 | 9 | 2 | 0 | 2 | 4 | 16 | 1 | 0 | 5 | 14 | 1 | 8 | ...... | | | |

The mixture P7 consists of equal parts of bonedust and superphosphate, and P8 of equal parts of blood and bone and of superphosphate. P5 consists of superphosphate 4 parts, and sulphate of potash 1 part.

| Fertilisers. | Average increase Yield due to Fertiliser. | | | | Value Fertiliser per acre. | | | Monetary increases per acre approximately. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | £ | s. | d. | £ | s. | d. |
| No Manure ... ... | 6 | 12 | 1 | 8 | ......... | | | ......... | | |
| 2 cwt. P7... ... ... | 7 | 10 | 2 | 2 | 0 | 19 | 0 | 8 | 0 | 0 |
| 2 ,, P5... ... ... | 8 | 7 | 0 | 9 | 1 | 3 | 0 | 16 | 10 | 0 |
| 2 ,, P8... ... .. | 8 | 0 | 3 | 23 | 1 | 1 | 0 | 13 | 0 | 0 |
| 2 ,, Superphosphate... | 8 | 11 | 1 | 25 | 0 | 10 | 6 | 18 | 10 | 0 |

Potatoes estimated at £10 per ton.

The above table shows that by a very small application of fertiliser, dusted along the drills, increases in yield ranging from nearly a ton to two tons, and equal to a monetary return of from £8 to £18 10s. per acre, are obtainable. The results on the rich volcanic soils of the Comboyne are most striking. There an increase in yield, ranging from 3½ to four tons, or equal to over 200 per cent., was obtained.

While it is true that the majority of farmers are aware of this means of increasing the crop, comparatively few adopt it, being quite satisfied with less progressive methods, and returns ranging from 25 per cent. to 50 per cent. lower than would be obtainable with an application of 2 cwt. of fertiliser. Farmers in the older potato centres of the world find it profitable to use a ton and even more of fertiliser per acre.

## Synopsis.

With few exceptions, farmers still fail to grasp the important part that humus plays in the successful production of a crop of potatoes. The choosing of a site which has produced a crop of legumes such as field peas, cowpeas, or vetches, or an old lucerne paddock, is still left to the select few.

The fertility of the soil must be kept up by increasing the humus content. Besides being the chief source of food supply for the plant, it is the main moisture-holding constituent of the soil, and its value in this respect alone, when one takes into consideration the dry spells encountered during the spring, is all-important.

Ploughing the land sufficiently early to conserve the late autumn and early winter rains is not practised to the extent that is warranted. Fallowing for three or four months allows the soil to become thoroughly aerated and sweetened, and its physical condition is much improved, thus ensuring a good seed-bed.

The majority of sowings were made in August and early September. The latter end of July may safely be "aimed at" without fear of frost, but providing the soil be moist there is little risk from the latter, as was instanced at Mount George, where the young plants were subjected to seven frosts, some more or less severe. Besides, earlier sowing means heavier yields, and the plants are nearing maturity before the land becomes dried out by the hotter weather.

The following figures dealing with three of the most popular varieties will help to illustrate the value of early sowing :—

| | Average Yield. | | | | | |
|---|---|---|---|---|---|---|
| | Up-to-date. | | Brownell's Beauty. | | Satisfaction. | |
| | tons | cwt. | tons | cwt. | tons | cwt. |
| Plots sown between 20th and 27th August ... | 10 | 12 | 7 | 8 | 6 | 17 |
| Plots sown between 3rd and 23rd September... | 6 | 2 | 6 | 10 | 5 | 6 |
| Increase in favour of earlier sowing ... | 4 | 10 | 0 | 18 | 1 | 11 |

The superiority of Up-to-date in the earlier sown plots is astonishing. After August sowing it averages about the same as Brownell's Beauty and Satisfaction. Probably it is because the latter varieties are reliable croppers, and that too during the warmer months of the year, that they are more popular among the Macleay, Manning and Hunter River potato growers, who rarely plant earlier than 1st September. One seldom hears of heavy yields from these late sowings unless sown on old cattle camps, or the sets are planted too close to be safe, under average conditions.

On several sections of the coast, mostly around the Paterson and Upper Hunter, farmers had experienced considerable loss by planting sets which had been saved from a strain extending into the third generation. For instance, at Paterson, Satisfaction was sown in 1917; seed from this farm was sown close by in the spring of 1918, and seed from the 1918 crop was sown again in 1919, this time alongside the Department's seed from the tablelands. Satisfaction was the variety, and the results were as follows :—

| | t. | c. | q. | lb. | |
|---|---|---|---|---|---|
| Local seed ... ... ... ... | 2 | 3 | 0 | 24 | per acre. |
| Departmental (Tableland seed) ... | 5 | 17 | 3 | 12 | ,, |

No wonder Hunter farmers prefer tableland seed !

## Other Trials on the Manning.

On Mr. T. Hoad's farm at Mt. George, a number of trials were carried out, dealing chiefly with size of set, depth, and distance of planting, etc. The soil was a rich alluvial loam, and the previous crops were maize in 1917 and pumpkins in 1918. The land was deeply ploughed in June and again early in August, and harrowed twice. It was an excellent moist seed-bed for planting on 19th August. The sets were covered with a cultivator run twice up the centres, and then harrowed. Germination good; young crop harrowed and cultivated twice, and hilled; few ladybirds were present. Over £200 was cleared off an acre.

An experiment to determine whether the Comboyne—a plateau within the district—can be utilised as a source of seed supply for local plots.

Up-to-date seed that had been saved from the previous spring crop (dug in March, 1919) and stored, was sown in comparison with seed from the tableland with results as follows:—

Comboyne *v.* Departmental Seed.

| | Comboyne. | Departmental. |
|---|---|---|
| Quantity of seed per acre ... ... | c. q. lb.<br>11 0 0 | c. q. lb.<br>11 3 15 |
| Average weight of set ... ... | oz.<br>1·7 | oz.<br>1·8 |
| Yield per acre ... ... ... ... | t. c. q. lb.<br>9 3 0 18 | t. c. q. lb.<br>12 6 2 0 |
| Percentage of marketable tubers ... | per cent.<br>94·1 | per cent.<br>96·1 |

The local seed had not undergone any of the recognised methods of storing, being spread out on the floor of an open shed; consequently it was somewhat flabby and did badly throughout.

Whole small, medium, large medium, and large sets were sown with results as follows:—

| | Small Sets. | Medium Sets. | Large Medium Sets. | Large Sets. |
|---|---|---|---|---|
| Quantity of seed per acre | c. q. lb.<br>8 1 0 | c. q. lb.<br>11 3 15 | c. q. lb.<br>14 0 3 | c. q. lb.<br>21 2 6 |
| Average weight of set ... | oz.<br>1·2 | oz.<br>1·8 | oz.<br>2·2 | oz.<br>3·7 |
| Yield per acre ... ... | t. c. q. lb.<br>12 15 1 6 | t. c. q. lb.<br>12 6 2 0 | t. c. q. lb.<br>15 1 1 16 | t. c. q. lb.<br>14 18 1 4 |
| Percentage of marketable tubers. | per cent.<br>95·6 | per cent.<br>96·1 | per cent.<br>95·2 | per cent.<br>92·8 |

The results show that sets of $2\frac{1}{5}$ oz. (equal to a duck's egg in size) yielded $2\frac{1}{4}$ tons per acre more than sets of $1\frac{1}{5}$ oz. (equal to a small hen's egg), and slightly more than a set of $3\frac{3}{4}$ oz. Eliminating the $1\frac{4}{5}$ oz. section (portion of which was damaged by cultivating), it seems safe to say that a whole set,

2 oz. or thereabouts in weight, is a size that can be recommended. Many farmers sow sets altogether too small, even dividing a $1\frac{1}{5}$ oz. tuber. Economising unreasonably with seed is unsound policy.

The use of small whole tubers can only be encouraged where they have been properly selected, otherwise they may be gathered from the "heap," and would, in all probability, contain a very large percentage of tubers from unproductive, weak, and perhaps diseased plants.

The larger seed tubers made best growth throughout, but there seems little to be gained by sowing too large a set.

An experiment was carried out with cut and uncut seed, with results as follows :—

| | Cut Seed. | Uncut Seed. |
|---|---|---|
| | c. q. lb. | c. q. lb. |
| Quantity of seed per acre ... | 7 3 12 | 14 3 0 |
| | oz. | oz. |
| Average weight of set ... | 1·2 (half tuber) | 2·2 |
| | t. c. q. lb. | t. c. q. lb. |
| Yield per acre... ... ... | 14 2 3 0 | 15 1 1 6 |
| | per cent. | per cent. |
| Percentage marketable ... | 96 | 95·2 |

The whole sets gave the greater yield. They germinated better and more evenly, and the plants, especially during the young stages, appeared to grow more rapidly. Farmers generally sow cut seed. In most cases this is unavoidable owing to the uneven seed purchased from the various agents.

With a cut set a certain percentage rot—due to either too moist or cold conditions shortly after planting, or else they become infected with dry rot. A cut surface is more susceptible to disease infection than an uncut tuber. An uncut tuber has a greater food supply to keep the young growth going whilst roots are forming than a "section" of a tuber.

With a whole tuber there is a probability of too many shoots coming, consequently a greater number of smaller tubers. More seed is required when sown whole and there is always the risk, when using smallish whole tubers, of sowing seed from unproductive hills.

| | 1 ft. apart in drill. | 1 ft. 3 in. apart in drill. | 2 ft. apart in drill. |
|---|---|---|---|
| | c. q. lb. | c. q. lb. | c. q. lb. |
| Quantity of seed per acre... ... | 10 3 6 | 9 1 20 | 7 1 24 |
| | oz. | oz. | oz. |
| Average weight of set ... ... | 1·5 | 1·5 | 1·6 |
| | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. |
| Yield per acre ... ... ... | 14 10 3 0 | 13 16 2 4 | 13 9 1 4 |
| | per cent. | per cent. | per cent. |
| Percentage marketable ... ... | 92·6 | 94·5 | 93·1 |

Farmers as a rule prefer sowing closely one way, and usually that is done in the drills where the practice is 1 ft. to 1 ft. 3 in. By keeping the drills 3 feet apart, cultivating and hilling are carried out without damage to the plants.

Some growers regulate the width between drills according to the variety. One making sparse or dwarfed top growth (like Manhattan or Satisfaction) is sown in drills as close as 2 ft. 6 in. apart. Growers contend that not sufficient shade is cast for protective purposes if the sowing is at a greater width.

| | Sets 4 inches deep. | Sets 6 inches deep. |
|---|---|---|
| | c. q. | c. q. |
| Quantity of seed per acre ... | 9 2 | 9 2 |
| | ozs. | ozs. |
| Average weight of set ... ... | 1·5 | 1·5 |
| | t. c. q. lb. | t. c. q. lb. |
| Yield per acre .. ... ... | 13 16 2 4 | 12 11 2 20 |
| | per cent. | per cent. |
| Percentage marketable ... .. | 91·3 | 89·8 |

About four inches is the usual depth for sowing, and unless the soil is of a light nature it can be recommended. Sets planted deeper are said to withstand dry periods better than the shallower planting. In the experiment under review, many of the deeper sets failed to germinate.

Up-to-date seed was used for the trials, with fertiliser at the rate of 2 cwt. of P7 per acre. The marketable percentage seems unusually high. This is accounted for by the high prices ruling for potatoes during the season, tubers that would be too small in ordinary seasons being included.

## Productivity as an Inherited Quality in Potatoes.

From investigations in Germany into the inheritance of productivity in potatoes in connection with the choice of tubers for planting (says the *Scottish Journal of Agriculture*), C. von Seelhorst comes to the following conclusions:—

The size of the tubers used for planting has a decided influence on the yield of the descendants, the large tubers being usually more productive than the small ones. The productivity of the parent plants appears to be of even greater importance, however, for in the tests small tubers from productive parent plants nearly always gave more productive descendants than those of large tubers from slightly productive plants. For example, whereas the smallest tubers (average weight, 33 grams) of productive plants had descendants that yielded, on an average, 519 grams of tubers per plant, the relatively large tubers (average weight, 84 grams) of poor producing plants had descendants that produced only an average of 488 grams of tubers per plant.

## THE SELECTION OF PROMISING WHEAT PLANTS.

CONSIDERABLE attention has recently been called to the subject of plant selection, especially in regard to wheat. It has been suggested that men should be employed to travel round the wheat districts in the harvest season to select productive plants or heads in farmers' crops. It is perhaps desirable that such selectors should have special training, but it is questionable whether any further training is required than a keen eye for observing plants which are more vigorous than their neighbours. Training and method are necessary, or at any rate desirable, in the testing of such individuals when once gathered, but the selection could be done by any intelligent and observant farmer or his son. Selectors are apt to have preconceived notions about the best plants or heads to pick out. It might here be stated that, for all practical purposes in breeding and selection, the stalks arising from an individual plant have the same value and show the same characteristics as a single head from that plant. Some experimenters prefer a broad or clubbed head, others a cigar-shaped head; some like to see short awns, and others prefer the head to be entirely awnless. Some look for a head with a large number of grains per spikelet, and others are content if the head is merely of great length. The fact is that these are not essential points in isolating a high-yielding variety, though they may be a guide. Yield of grain per plant is the final and conclusive indication of productivity. Defects such as weakness of straw, shattering of grain, rust liability, and undue softness of grain would disqualify a plant for selection, but an individual with medium-sized heads often has more stalks and gives a greater yield than a plant with very large heads. Miracle or Mummy wheat is an instance of this.

A farmer who passes through his crops every day for perhaps a month before he starts stripping has a better chance of seeing a particularly desirable plant as the wheat begins to ripen than a visiting expert, who may only have time to spend half a day at the farm. One may say, "How are you going to get farmers sufficiently interested to bother with plant selection?" It is quite likely that only a few would take it up, but with even two or three keen selectors in each wheat district we should have a quantity of material tested each season among which useful local varieties are likely to be found, and possibly varieties adapted to more than one wheat district. When located in the crop, plants so selected for separate harvesting should be marked by tying a narrow strip of coloured print just below the head, and before stripping such plants should be pulled up by the roots and hung up away from mice till they can be threshed.

Such selections might be tested in rows adjacent to standard varieties, and if superior could be forwarded to the Department for further testing. The apparent superiority which took the eye in the field is not always transmitted to the next generation, and only testing in an isolated plot with other selections and alongside a standard variety for comparison will prove whether the selection is worth going on with or not.—J. T. PRIDHAM.

# Improvement of Sweet Sorghums.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

SWEET sorghum may be considered an extremely variable species of plant. There appears no doubt that all our cultivated varieties (including Sudan grass) originated in Africa, and as there is a considerable diversity between the wild and cultivated forms as found in that continent, little wonder can be expressed at the numerous types grown in other countries. In the United States more types are grown than in this State. Commercial seed houses there catalogue types called Sumac, Red Amber, Dakota Amber, Minnesota Amber, Honey, and Collier.

These are very distinct types, not only in the habit of the plants, but also in the colour and shape of the seed. In this State the principal commercial types are Planter's Friend and Imphee (both derived from the South African Imphee types), Amber Cane, *Sorghum saccharatum*, and (more recently) Saccaline. These are also very distinct in habit of growth, and shape and colour of seed.

The sorghum flower is particularly adapted to wind pollination, and crossing between types grown close together and maturing at practically the same period is sure to happen. Crossing very readily takes place with broom millet, but owing to the very pithy nature of that plant the seed from such crosses is worthless. A broom millet x sweet sorghum plant is quite as pithy as the original broom millet parent. It is a very important matter, therefore, that farmers should obtain seed as true to type as possible. At the present time crops of sorghum with a distinct lack of uniformity and containing two or more types, are quite common.

### How Improvement is Effected.

In addition to the natural cross-pollination of different strains of sorghums, crossing also takes place between plants of the same strain. If an ordinary crop of Planter's Friend be examined, for example, certain individual plants will be found to be marked by exceptional vigour and other desirable characters. Such plants are called by scientists "heterozygotes," and the exceptional vigour, etc., are due to the combination, or segregation, of certain factors, or "units." If the seed of the individual heads of such plants be sown the following season in such a way that each row represents the progeny of one certain parent plant, there will be a considerable diversity in the plants, some being very good, others medium, and others very poor. The result is quite in accord with Mendelian principles, for in the parent plant—that is, the first generation of the cross—certain undesirable characteristics, known as recessives, were suppressed, and these reappear in the second generation. The best plants

of the second generation can now be selected, care having been exercised that cross-fertilisation with the inferior ones has been avoided by bagging the heads. If the seed of such plants be sown the following year, it will be found that in all probability a fairly uniform type has been produced which possesses desirable characteristics.

We have now the nucleus, after three years, of an improved strain of sorghum. In the following season, the seed from the best plants or from the best row of plants can be sown in a bulk plot for working up a stock by mass selection, or in a head-to-row manner as in previous years, for further improvement. If desired, the best pure line progeny can be determined by comparing the weights and other characteristics of each individual row, each row representing one particular plant.

The composition of the various Mendelian units or factors which determine the best plants, and the combination or segregation of the various factors in the successive progenies have never been investigated. In improving the strain, however, such knowledge is not essential. By experience, it has been shown that certain desirable characteristics can be selected and improved. Such features as sweetness, early maturity, height, sturdiness (including sturdiness of head stalk), and probably (although not definitely proved) resistance to "stain" can be developed by the methods described.

Working on these principles, one strain of sorghum of the Planter's Friend type (temporarily called No. 61) has now been developed and is being sown on a fairly large scale. At Wollongbar Experiment Farm this sorghum proved considerably superior during the past season to local Planter's Friend in yield and sweetness, and earlier in maturity. At Grafton Experiment Farm it exceeded the new variety Saccaline in yield, was three weeks earlier in maturing, and exhibited no noticeable inferiority in sweetness. At Berry and at Glenfield it was also better than any other variety grown.

Three other strains that are most promising in character have also been developed, but seed is not available for sowing on a large scale.

An interesting feature in connection with this improvement work has been noticed in the development of a particular strain. Plants were selected for excessive thickness and large seed heads, pithy plants being discarded (as in the other strains) when the heads were harvested. It has been noticed that while the strain breeds remarkably true for sturdiness and large seed heads, the pithiness appears much harder to eliminate than in the other strains.

### Characteristics of No. 61.

This sorghum is distinct from Planter's Friend in possessing better stooling qualities, a heavier clean leaf growth, and earlier maturity. Its seeding qualities are particularly well developed, the heads, which are fairly compact, being 9 inches long and averaging 3 ozs. per head in weight. The outer seed glumes are much redder in colour than those in ordinary Planter's Friend, and the seed stipules are also fairly common. From a half-acre plot of this sorghum about 1,500 lb. of seed was harvested, to be used on farmers' experiment plots and distributed to farmers.

### Early Amber Cane Improvement.

In addition to Early Amber Cane for the coastal districts, it has been found that a great deal can be done in developing a strain suitable for the western districts. Acclimatisation is a big factor in such work, and at Cowra, Bathurst, and even at Nyngan during the past season, Amber Cane, which is the progeny of selected and acclimatised plants grown at the respective farms during the past four years, has produced very satisfactory results. The manager of Cowra Experiment Farm reports that it has yielded better under the drought conditions than the grain sorghums.

### Improvement of Saccaline.

This new strain of sorghum has been grown largely by farmers during the past season. Last year it was credited with greater yields than Planter's Friend, but during the present season there have been several plots of the latter which have yielded better than Saccaline grown alongside. It is also slower in maturing than Planter's Friend, a difference of three weeks being noticed in some cases. Whether its second growth is faster and greater remains yet to be proved. Advantages which it undoubtedly possesses over Planter's Friend are its superior sweetness and its greater stooling qualities. Last year it was credited with being more free from stain than ordinary Planter's Friend, but during the present season it has in some localities been badly affected.

In improving Saccaline, therefore, particular attention should be paid to shortening its period of maturity, as well as increasing the yield. That the yield can be increased seems fairly evident from experiments carried out at Wollongbar, but sufficient work has not yet been done to effect any marked improvement in shortening the period of maturity.

The wide heavy foliage of Saccaline, its sturdy stalks, its sweetness, its stooling qualities, and its large heads of seed render it a very attractive sorghum. It is sure to be grown largely by coastal farmers in the future.

## Sorghum Chaff as Feed for Working Horses.

Sorghum crops on farmers' experiment plots in the north-western district were so adversely affected during the 1919-20 trials that only in one instance were comparable yields obtained. These were on the plots belonging to Mr. H. Lye, Loomberah, Tamworth, where Planter's Friend yielded 1 ton 8¾ cwt. of green fodder, and Saccaline and Feterita each yielded 1 ton, Early Amber Cane 13½ cwt., and Kaoliang 7½ cwt. During the wheat sowing period Mr. Lye has been feeding his working horses upon two parts straw chaff and one part sorghum chaff, and although worked every day the horses actually picked up in condition. Owing to this favourable result, the owner intends to sow a larger area to the grain sorghum Feterita next year, to cut the crop for hay, and to add a portion of sorghum chaff to the ordinary ration for his working horses. The grain added in this way will be substituted for maize.—H. Bartlett, Assistant Inspector of Agriculture.

# Papago: A New Variety of Sweet Corn.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.


A Cob of Papago.

In 1918, through the courtesy of the Director, a few pounds of Papago sweet corn was received from the University of Arizona Agricultural Experiment Station, U.S.A. This variety was stated* to have outyielded more than fourfold any of the best eastern varieties, such as Stowell's Evergreen and Country Gentleman, chiefly owing to the fact that the pollen of these latter varieties was not resistant to the dry heat which is usually experienced at that station in summer, while the pollen of Papago seemed to have this resistant quality. This difference caused pollination to be very defective in the eastern varieties and resulted in poor grain formation, some cobs carrying twenty or thirty scattered grains, whilst Papago showed no defect in pollination, the grain formation being very high and the cobs well filled.

It was thought, therefore, that this variety would be worth a trial on the Murrumbidgee Irrigation Area, where the hot winds in summer are known to have a similar extremely injurious effect on field maize. In the trials on this area, conducted by Mr. G. G. Potts (then Inspector of Agriculture but now an officer of the Water

* Arizona Agricultural Experiment Station Bulletin 75 (1915).

Conservation and Irrigation Commission), Papago considerably outyielded all other varieties tested with it, but Mr. Potts attributes the result largely to the fact that, being later than all these varieties, it was fortunate in tasselling when the hot winds had passed. There was, therefore, no opportunity of testing whether the pollen of the Papago variety had the drought resistant quality claimed for it, although the other varieties mostly differed in their setting of grain on account of not being resistant to the hot winds which came during their tasselling period.

The yields from Papago in these tests were nevertheless so outstanding that it was thought that the variety would be worth testing in other districts. Unfortunately, a plot that was being saved for seed at Leeton was broken into and destroyed by cattle, and further comparative tests with this variety could not be made until additional seed was obtained. A little seed of Papago sweet corn has now been produced by Mr. R. Yates, Ourimbah, and will be available for trial this season.

Although he had no means of comparing Papago with other varieties, Mr. Yates is well pleased with the amount of seed obtained from a small plot; about 4 bushels of grain were obtained from less than one-tenth of an acre—an indication that Papago will be a high producing variety of sweet corn in other than dry districts.

Papago is a late variety, being a fortnight or so later than Country Gentleman or Stowell's Evergreen, which each take about 3½ months to reach the canning or harvesting stage. It has a distinct tendency to be prolific (that is, to bear two or more ears per stalk) and, as usual with prolific varieties, it also suckers somewhat freely if sown early on rich ground. The growth of stalk reached nearly 9 feet in the writer's home garden last season, and ears were obtained up to 9 or 10 inches in length. The ears are long and narrow, and the grain is not as deep as some other varieties, but this is compensated for by the length and number of cobs produced. The cobs are not well covered with husk, but this is not a great defect for sweet corn, except when it is being grown for seed, weevils then infesting it readily. The quality is not quite up to some varieties of sweet corn, but it is still greatly superior to field corn.

In view of the large amount of canned sweet corn imported into Australia from America, there seems an excellent opportunity for some New South Wales fruit canning factory in a district suitable for sweet corn to develop this industry as a side line. Papago can in the meantime be thoroughly recommended for the home garden.

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AT the head of all the sciences and arts, at the head of civilisation and progress, stands—not militarism, the science that kills, not commerce, the art that accumulates wealth—but agriculture, the mother of all industry, and the maintenance of human life.—JAMES A. GARFIELD.

# Summer Green Fodder Trials.

## Murrumbidgee Irrigation Area, 1919-20.

A. N. SHEPHERD, Assistant Inspector of Agriculture.

Green fodder trials embracing both sorghums and maize were carried out during the past season on the above area. The settlers co-operating with the Department were—

M. McKenzie, Farm 203.
H. Booth, Farm 854.
W. Evans, Farm 139.
H. A. McDonald, Farm 151.
W. Edwards, Farm 367.

During the season the conditions were most trying, dust storms and wind being very prevalent, resulting in high evaporation, while the rainfall was practically nil, the falls that did occur being very light and of practically no use to the growing crops. Notwithstanding the adverse conditions, very good germination was obtained throughout the plots, the result of the careful preparation of the soil and irrigation previous to sowing.

Irrigation had to be constantly practised at each rotation throughout the growth of the crop. The rainfall registrations were as follows:—November 39 points, December 142, January 57, February 0, March 97, April 47.

In the sorghum trials, Saccaline was grown for the first time on the area, and, while giving heavy returns, took much longer than the other varieties used in the trials to mature.

To obtain a good germination in the hotter weather, it is essential that after drilling the land be rolled to compact the soil and encourage quick germination before the moisture dries out under the very high evaporation of the summer months. If a roller is not available ordinary tine harrows, turned upside down and weighted, give even better results, for while a roller compacts the surface, the harrow used in this way tends to pack the soil under the surface and right on the seed, at the same time leaving on the surface a layer of loose soil which tends to lessen evaporation. This practice has been adopted in autumn sowing with very satisfactory results.

*Farm* 203.—The experiment was conducted on grey loam soil and in places crab-holey. The previous crop had been barley, sown in autumn, 1919, and grazed off with cattle. The land was irrigated previous to ploughing on 21st October, and was afterwards broken down with the disc-harrow. The land was again irrigated on 7th November and cultivated with the rigid tooth cultivator. The seed was sown on 15th November, 1919, with a

wheat drill, in rows 14 inches apart, every second hopper being blocked up. The rate of seeding was 15 lb. per acre, and superphosphate was used at the rate of 1 cwt. per acre.

A very good germination was obtained, but as the crop grew and irrigation water was applied, those plants growing in the crab-holes made very little growth, lost colour, and appeared sickly.

The Early Amber Cane matured and was cut on 29th January, 1920, while the Saccaline and Planter's Friend was harvested two months later, but with much heavier yields.

*Farm* 854.—A variety trial was sown on red clay loam on 21st October, 1919. The land had received a thorough preparation, check banks being put in every half chain to facilitate watering by flood irrigation. A rather patchy germination was obtained, but very good growth followed. The Early Amber Cane matured in twelve weeks, while the Saccaline was not cut for another two months, but gave just double the yield of the Amber Cane.

*Farm* 139.—Four varieties of sweet sorghum were used in a variety trial on this farm, and all gave very satisfactory results.

Lucerne had been previously grown on the land, which had been broken up in 1917 and wheat sown; after this crop had been cut for hay the lucerne made very good growth and was used as grazing for sheep.

The land was disc-ploughed in December, and well worked down previous to seeding, with the result that a perfect stand was obtained. Very rapid growth was maintained, the Early Amber Cane maturing in nine weeks, and the *Sorghum saccharatum* a week later, with a yield of 25½ tons per acre. The other varieties, Planter's Friend and Saccaline, were cut a month later, with very good results. Even then heavier yields might have been obtained if the crop had been watered in the later stages of growth, but owing to the tall growth and the exceptionally heavy winds, irrigation could not be carried out, as the crop would have lodged. In fact, that did happen in the case of the *Sorghum saccharatum*, with the result that the harvesting was made very difficult.

*Farm* 151.—Saccaline was tried in conjunction with Early Amber Cane, and similar results were obtained to those on other sections of the area—heavier yields but slower maturity. The experiment was sown on grey crab-holey country, and although the land had received a thorough preparation and rolling was practised after sowing, the germination was not all that could be desired; nevertheless, a very satisfactory crop was harvested.

*Farm* 367.—A variety trial of maize was conducted on this farm on red clay soil, the yields comparing very favourably with those of sorghum, and varying from 9½ to 12 tons per acre of green fodder. The seed was sown in drills 3½ feet apart at the rate of 20 lb. per acre. This crop followed after Japanese millet, which had been grazed off with cattle. A very good germination was obtained, and splendid growth followed, a height of 12 feet being attained in some cases. The crop was harvested 3½ months after sowing.

### The Results.

All plots were fertilised with superphosphate, the sorghum at the rate of 1 cwt. per acre, and the maize at 2 cwt. per acre.

The most noticeable result in the trials was the heavy yields obtained on Mr. Evans' farm, following after lucerne. Not only were the yields there much heavier, but the crop matured very much more quickly on this plot than on the others on the area.

YIELDS of Summer Green Fodder Trials.

| | Early Amber Cane. | | | | *Sorghum Saccharatum.* | | | | Planter's Friend. | | | | Saccaline. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| M. McKenzie ... | 15 | 13 | 2 | 8 | 17 | 17 | 0 | 0 | 19 | 15 | 0 | 0 | 18 | 6 | 3 | 4 |
| H. Booth ... ... | 7 | 14 | 2 | 16 | | ......... | | | | ......... | | | 14 | 16 | 1 | 20 |
| W. Evans ... ... | 15 | 6 | 1 | 20 | 25 | 2 | 3 | 13 | 19 | 2 | 3 | 12 | 18 | 11 | 1 | 20 |
| H. A. McDonald ... | 7 | 17 | 0 | 16 | | ......... | | | | ......... | | | 17 | 5 | 2 | 24 |

Yields of Green Maize on Mr. Edwards' farm :—

| | tons | cwt. | qr. | lb. |
|---|---|---|---|---|
| Large Macleay Yellow ... ... ... | 12 | 2 | 1 | 26 |
| Red Hogan ... ... ... ... | 11 | 10 | 2 | 28 |
| Yellow Horsetooth ... ... ... | 11 | 8 | 2 | 21 |
| Leaming ... ... ... ... ... | 11 | 4 | 2 | 27 |
| Narrow Red Hogan ... ... ... | 10 | 7 | 0 | 0 |
| Improved Yellow Dent ... ... ... | 9 | 17 | 0 | 16 |
| Golden King ... ... ... ... | 9 | 7 | 1 | 4 |

## THE GIANT SUNFLOWER AS A CROP.

"I SHALL be much obliged if you will advise me as to the price per ton now obtainable for the seed of giant sunflowers. I would also appreciate any information relative to the advantages of growing and marketing this crop."

The foregoing was received from a correspondent recently. He was informed to the following effect :—

The market for sunflower seed is somewhat limited, the commodity being chiefly used for poultry and bird feed, excepting in Great Britain, which country imports a large quantity for its oil, which is used in the manufacture of soap and candles. The latest price we have heard quoted in London is about £50 per ton, but one local firm state that they are buyers at £35 per ton.

The average yield of seed per acre may be put at 1,000 to 1,500 lb. As the land required for most successful growth is usually suited to the production of broom millet or maize, and as the dry stalks of sunflowers after harvesting are too coarse and fibrous to be of much value for feed, either of the other crops mentioned would probably be more profitable.

The green stalks are sometimes utilised in silage, especially in cold climates, where the bulk produced is greater than that of maize or any other crop. Before the war, large quantities of sunflower seed were imported into Great Britain at £13 to £15 per ton from cheap producing countries like Russia, India, China, and Egypt, so that none but a limited local market can be depended on.

# Chats about the Prickly Pear.

## No. 5.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.
(Government Botanist and Director, Botanic Gardens, Sydney.)

### Pear as Stock Food in the United States.

MEXICO and certain south-western portions of the United States are the principal home of prickly pear, and information has accumulated there which we would do well to study carefully, with the view of applying the lessons to Australian conditions.

We may group the information (chiefly extracts from the works of Dr. D. Griffiths and Mr. R. F. Hare) as follows:—

A. General—
1. Chemical analysis.
2. A balanced ration of pear.

B. Dairy Stock—
1. Pear for milk production.
2. Some dairy rations that include pear.
3. A pear-eating cow.

C. Working Cattle—
1. Pear for fattening and maintaining cattle.
2. Pear as a ration for working animals.
3. Effect of pear on stock.

### A.—General.

*Chemical Analysis.*—A number of analyses will be found in the pamphlets enumerated in the bibliography. Some notes by Mr. R. F. Hare, in Bulletin No. 17, p. 91, New Mexico (without the analysis) may be quoted.

It is the custom in some sections of this territory and Texas to burn the spines off the flat-jointed Opuntias, known as "prickly pear" or "nopal," and feed the singed stems to stock when other feed is scarce. In this investigation of the value of the common feeding stuffs it was thought advisable to ascertain the feeding value of such material, as nearly as could be done without feeding experiments, so specimens of this plant were collected and analysed. The specimens obtained by an assistant (*O. camanchica*) were the first found, although not the commonest species in this locality, but it was used in the belief that the chemical analyses would give practically similar results for the different species. Besides this there is no attempt to select species when collecting the plants for feed, so the analysis of any one species is probably as good as that of any other.

An examination of the table of analyses will show a very large percentage of water and ash, and a very small percentage of organic matter of any kind. If fed enough of such material stock will not starve immediately, and it would do to tide over a short period of scarcity, but it is a poor feed under any circumstances.

The first analysis of prickly pear in Australia that I can trace is "The Analysis of Prickly Pear—On the Occurrence of Arabin in the Prickly Pear (*Opuntia brasiliensis*)," by W. M. Hamlet, Proc. Roy Soc. N.S.W., XXIII, 324-5, 1889. The species is probably *O. monocantha.*

Then we have "Analyses of Prickly-pear," by F. B. Guthrie, *Agricultural Gazette,* August, 1900. Also, by the same author, "Prickly Pear—Analyses, Fodder Value, and Destruction," published as a pamphlet, 1907. The plate shown is *O. monocantha,* the proliferous variety, and it is labelled *O. brasiliensis* by mistake, that being a name under which it went in Australia for over fifty years. I passed on the name to Mr. Guthrie before I knew better. Mr. Guthrie also made an analysis on 6th May, 1910, of one of Mr. Luther Burbank's so-called "spineless cacti," imported under the name of "Santa Rosa," with the following result:—

| | | |
|---|---|---|
| Moisture ... ... ... ... ... ... | 94·48 | per cent. |
| Ash ... ... ... ... ... ... | 1·16 | ,, |
| Fibre ... ... ... ... ... ... | 0·60 | ,, |
| Albuminoids ... ... ... ... ... | 0·38 | ,, |
| Carbohydrates ... ... ... ... ... | 3·28 | ,, |
| Ether extract (fat or oil) ... ... ... | 0·10 | ,, |
| | 100·00 | |
| Nutritive value ... ... ... ... ... | 3·8 | ,, |
| Albuminoid ratio ... ... ... ... | 1 to 9·2 | ,, |

Other analyses are given by J. Lewis in the *South African Agricultural Journal,* February, 1912; by J. C. Brunnich in the Annual Report of the Queensland Department of Agriculture and Stock, 1908-9, and by Griffiths and Hare in U.S. Bulletin No. 102.

The most exhaustive paper on the subject of digestibility known to me is "Experiments on the Digestibility of Prickly Pear by Cattle," by R. F. Hare, published as Bulletin No. 106 of the U.S. Bureau of Animal Industry (1908), and in the same year as Bulletin No. 69 of the New Mexico Agricultural Experiment Station, the experiments having been conducted in that State. The pears treated were not our pest pear, nor any species acclimatised in Australia (out of a botanic garden), and experiments were also made with feeding stuffs.

*A Balanced Ration of Pear.*—At page 25 of New Mexico Bulletin No. 60, and p. 10 of U.S. Bulletin No. 102, we have the question of a balanced ration discussed. It is pointed out that, in order to find in what proportion pear should be fed with other foods to produce a balanced ration, it is necessary to know the amount of digestible nutrients contained in it, as well as those of the food or foods with which it is to be fed. Unfortunately, we have few data in regard to the pest pear in different districts, and here is one of the many, yet very important, investigations which await the attention of the veterinary authority and of the chemist. In view of the absence of the necessary data as regards the pear in the United States, Griffiths and Hare, for the purpose of their article, ask leave to assume that its digestion coefficient is not very different from that of immature green corn fodder. The matter is very important, but cannot be usefully

further discussed at this place under the circumstances. Here is valuable work which could profitably employ the attention of a number of our young veterinary graduates.

### B.—Dairy Stock.

*Pear for Milk Production.*—Dr. Griffiths remarks, in U.S. Bulletin No. 74, p. 20, as follows:—

It is universally recognised throughout the pear region of south-western Texas that the plant has a decided tendency to increase the flow of milk. In spite of the fact that the average ranch feeder claims that pear is of little or no value in the summer, there are hundreds of people who feed more or less definite quantities of this plant from one year's end to another. It is always used as a supplementary ration. Pear alone has not been fed to a great extent, for it is recognised that it is properly a supplementary ration to a more concentrated feed. Mr. John Bowles, near Eagle Pass, has fed pear, with hay and bran, to a milch cow for the past three years, and would not think of discontinuing the practice. Some dairymen in the small towns where pear is accessible feed it regularly, and nearly all of the Mexican families who keep a cow in town depend upon this as their mainstay.

One example of very successful feeding, where somewhat definite data were obtainable, came under the observation of the writer, and might be cited here. Mr. Albert Ingle, of Eagle Pass, Texas, keeps one Jersey cow to supply milk and butter for family use. The cow has the run of the commons about town, but the pasturage is very short the greater part of the time. In addition to what she can pick up in this way she is fed 3 quarts of bran, 1 quart of cotton-seed meal, and all the singed and chopped pear she will eat. Mr. Ingle was feeding when his place was visited. The quantity chopped that morning, he stated, was an average one, and weighed 35 lb.. which amount was fed twice each day. The cow at the time was raising a calf and furnishing milk for the family, and was in good milking condition. This shows that the amount of pear fed was large. The ration each day was 6 quarts of bran, 2 quarts of cotton-seed meal, 70 lb. of chopped pear, and what the animal was able to pick up on very short range. This ration is kept up during the year, except when the mesquite beans are abundant, when no pear is fed.

Other definite testimonies are quoted in the Bulletin.

*Some Dairy Rations that include Pear.*—This is dealt with at p. 22 of U.S. Bulletin No. 74, and the evidence is so important, and has such a direct application to Australia, that I give Dr. Griffiths' statements in full:—

The practice of feeding dairy cows upon a partial ration of pear is very common—indeed, general—in the entire region of the lower Rio Grande, and as far north as San Antonio, Texas. The necessity for feeding this plant depends upon the condition of the seasons. When the winter rains are abundant and green feed is plentiful, no pear to speak of is fed; but during a dry winter it is resorted to as the most economical method of supplying the succulence so essential to the maintenance of a good flow of milk. The amount fed depends largely upon the quantity of pear available and the labour at hand for handling it. In some cases which have come under the writer's direct observation the pear has been hauled 6 miles to feed to dairy cattle, and it is as much prized by many dairymen as any other part of their feed stuffs.

Mr. J. W. Statcher feeds 100 dairy cows regularly for three or four months during the winter. The feeding begins when the leaves fall off the brush in the autumn, and continues until they appear again in the spring. The ration for a cow is about as follows:—Cotton-seed meal, 2 lb.; cotton-seed hulls, 8 lb.; bran of wheat or rice, 1 gallon; singed pear, 40 lb.; the run of brush pasture.

Mr. J. G. Hagenson's practice does not differ materially from that of Mr. Statcher. Having no pear, however, he buys it at 25 cents per load, a load consisting of about 2,000 lb. His cattle get a ration approximately as follows:—Bran, 9 lb.; cotton-seed hulls, 10 lb.; singed pear, 30 to 40 lb.; the run of dry brush pasture.

In order to secure a better idea of the practices in vogue for feeding pear in the vicinity of San Antonio than time for personal inquiry would warrant, a circular letter was addressed to several dairymen. The following questions

and answers in connection with the above discussion give a good idea of the practices which obtain and the estimate placed upon the prickly pear of the region as a succulence for milk production. Answers to the questions proposed were furnished by several dairymen. The following are considered typical, and are reproduced here practically in full:—

1. Do you feed prickly pear to your dairy herd? How many years has this practice been followed?

*Answers.*—(*a*) During the winter months only. (*b*) I do in winter; five years. (*c*) Yes; for fourteen years. (*d*) Yes; have fed off and on for a number of years. (*e*) Yes; during the winter time; for about twelve years. (*f*) I have fed prickly pear to my dairy cows for nine years.

2. How long did you feed during the past winter?

*Answers.*—(*a*) About fourteen weeks. (*b*) All winter. (*c*) All winter. (*d*) Did not feed pear last winter because other feeds were very cheap. (*e*) None at all. (*f*) Did not feed during the past winter, on account of having moved to a place where it was inconvenient to get it.

3. How do you prepare prickly pear for feeding?

*Answers.*—(*a*) Make brush fire and burn thorns off. (*b*) I use a pear burner. (*c*) Singe the thorns off and cut it up. (*d*) I run the pear through a pear cutter and mix with cotton-seed meal and hulls. (*e*) Burn the thorns off; then chop in small pieces. (*f*) I first burn off the thorns with a dry brush fire, and then cut into small pieces with a large carving knife.

4. How much pear do you feed a cow each day? If you do not know the exact number of pounds, estimate it as closely as possible. How many loads per day do you feed to how many cows?

*Answers.*—(*a*) I feed about two-thirds of a common water bucket full to each cow in the morning. (*b*) I give the cows as much as they can eat once a day. (*c*) About 10 or 15 lb. per cow. (*d*) I feed 1½ bushels to a cow each day. (*e*) One load of about 3,000 lb. lasts sixteen cows about three days. (*f*) I give each cow about 6 gallons of pear cut up into pieces about 2½ inches square.

5. What other feeds do you give the cows with pear? How much of each kind of feed per cow?

*Answers.*—(*a*) I feed cotton-seed meal and bran. (*b*) Bran and cotton-seed meal. (*c*) One quart of cotton-seed meal, 1 peck of cotton-seed hulls, and all the cane they want. (*d*) One quart of cotton seed, 1 quart of cotton-seed meal, and 20 lb. of hulls per day. (*e*) One and one-half quarts of cotton-seed meal, 8 quarts of wheat bran, 20 lb. of cotton-seed hulls. (*f*) I give my cows 10 lb. per day of a mixture of cotton seed and wheat bran, in addition to the 6 gallons of prickly pear.

6. Do your cows have the run of any pasture while you feed pear?

*Answers.*—(*a*) Yes. (*b*) Yes. (*c*) Yes. (*d*) No. (*e*) Very little. (*f*) Yes.

7. Do you consider that pear influences the flavour, odour, or quality of the milk in any way?

*Answers.*—(*a*) It does if fed more than two-thirds of a common water bucket full to each cow in the morning, or in any other way. Feeding at night affects the odour of the milk slightly and gives butter a pale colour. (*b*) It increases the quantity of milk 40 per cent. (*c*) It does not affect the flavour or colour, but it may reduce the weight or richness of it. It increases the quantity. (*d*) No; I do not think it influences the flavour, odour, or quality of the milk at all when fed as I have mentioned. (*e*) When too much pear is fed, and not enough solid feed, the milk has a peculiar odour, is very poor in quality, and blue in colour. (*f*) Prickly pear does not injure the flavour of the milk. It increases the flow. Cattle are very fond of it.

8. Do you have pear in your pastures, or do you buy it? If you buy, how much do you pay per load?

*Answers.*—(*a*) I have it my pastures. (*b*) I have pear in my pastures. (*c*) Yes. (*d*) I buy it at 25 cents per load and haul it myself. (*e*) I buy my pear; it costs me 25 cents per load of 3,000 lb. I haul it myself. (*f*) I have pear in my pastures.

9. What is your estimate of the value of pear for milk production?

*Answers.*—(*a*) I consider pear very valuable as a feed, and it is a good milk producer. It is very healthful to be fed with cotton-seed meal, &c. (*b*) (No

answer). (*c*) It is far ahead of any kind of hay or forage, and mixed with meal or bran nothing can beat it. (*d*) It is a good milk and butter producer. (*e*) A very good feed when you have no roughage. (*f*) It does not pay to buy pear unless hay is scarce and dear. When sorghum hay is only \$7·50 per ton, as it is now, hay is cheaper than pear at 25 cents per load when you have to haul and burn it.

10. After a crop of pear has been cut, how many years will it take for another crop to grow on the same land?

*Answers.*—(*a*) About two; but this will depend a good deal on the season. Pear burners are discarded by some, for the reason that they destroy the plant. (*b*) The pear begins to grow the following year. (*c*) Three years. (*d*) It takes from three to five years to make good-sized pear. (*e*) I do no know, but think about two years. (*f*) About two years.

It is very difficult to formulate a definite opinion regarding the effect of pear upon the quality of milk. There appears, however, to be a very well-established opinion that it produces blue milk if not fed with concentrated feeds. There seems to be a great diversity of opinions regarding the flavour of milk from pear-fed cows. Many maintain stoutly that it produces a slightly bitter taste, which is less noticeable when a good ration of corn (maize) or cotton-seed meal is added, while others defy tests that will detect in any way pear milk from any other except by its poorer quality in cases where the amount of pear fed is large and the entire ration is of low nutritive value. Personally the writer has been unable to verify any of these opinions.

In the New Mexico Bulletin No. 78 (1911), which is a very valuable bulletin on prickly pear, at p. 19 we have statements as to its value for milch cows, although it is stated that they have much more experience in Texas. Following are two of them:—

Another use of cacti, which is of particular importance in New Mexico, is as a part of the ration for milch cows, especially for dairy stock. No very satisfactory pasture grass for this purpose has yet been discovered in our State, and the result is that most milch cows are fed on dry feed the year around, and many of them never go out of the corral. For such stock a cactus patch offers a much needed succulent feed and equally needed exercise in gathering it. Dairymen in Texas have been using such cactus pastures with excellent results for a number of years. The cactus is to be fed as part of the ration only, and part of it should be fed chopped and mixed with the grain feed at the regular feeding time.

There is probably not a farm or a dairy in this State on which a small area of land could not be profitably used as a cactus patch for the milch cows. If this were properly chosen it need not be valuable land, since the cacti will grow on land too rough for ordinary farming operations.

Once more we wish to emphasise the fact that the great value of this plant as a source of succulent feed, as well as for roughage, lies in its ability to take up water whenever it can get it, and utilise nearly all of it for making forage.

Experience has shown that cattle prefer the older joints to the young, leathery ones; that they will eat frozen ones; that they learn to enjoy the feed; that the spines of chopped cactus bother them very little when fed with other roughage; that after they learn to eat the cactus they will work on the spiny unsinged plants, thus demonstrating that the spines bother them very little. Another advantage of this feed as a succulent portion of a ration is that it is at its very best for feeding purposes in the winter time, when other succulent feed is scarce or entirely lacking.

Under the heading "Prickly pear for Dairy Cows," Mr. E. W. Morse, of the Department of Agriculture, Queensland, in a letter to the *Breeder's Gazette,* copied in the *Victorian Journal of Agriculture* for February, 1915, p. 103, quotes the favourable experience of the United States Department of Agriculture (Dairy Division) in regard to the use of the pear in Texas.

*A Pear-eating Cow.*—Some years ago an English gentleman, who had lived forty years in Southern Italy, called upon me and we examined the

prickly pears in the Botanic Gardens together. He informed me that Opuntias are especially common in Sicily, Sardinia, the Island of Capri, Naples, and the Gulf of Salerno. They form an important item in the husbandry of South Italy, cows being regularly fed upon them and stony or bad land utilised for their culture. The spinescent forms are grown for ornament, but the great majority are the so-called Indian Fig or *Opuntia ficus-indica,* which produces a fruit used by man, while the spines and spinules are fewer than in most species. He made the observation that they have evolved a very good pear-eating cow, which, he stated, was a cross between the Holstein and Jersey; it was surprising to see to what extent these animals could eat prickly pear without their mouths becoming inflamed as would have become those of ordinary cattle. The statement appears to be of sufficient interest for further inquiry.

## Pop Corn Variety Trial, 1919–20.

A trial of different varieties of pop corn was made last season on the farm of Mr. T. Smith, Tuggerah. The season was extremely good, and scarcely at any time during the growth was there a deficiency of moisture in the soil. The soil on which the experiment was conducted is not a rich one, being typical of much of the somewhat flat land in the district, which is mainly used for dairying and the growth of attendant summer and winter fodder crops—maize, sorghum, oats, wheat, &c. A fertiliser mixture consisting of equal parts of superphosphate and blood and bone was applied at the rate of 2 cwt. per acre, though Mr. Smith has demonstrated since to his own satisfaction that the departmental recommendation of a fertiliser mixture consisting of equal parts of superphosphate and bonedust without any blood will give better results.

Sowing was made on 8th October, 1919, and the earliest variety, Black Beauty, was fit to pull in less than four months, the latest of the other varieties being ready nearly a month afterwards. The average height of growth ranged from 5 feet in Black Beauty to 8 feet in Mapledale Prolific, the growth of the latter variety being the best the writer has yet seen in this State.

The following are the results:—

| Variety. | Yield per acre. bus. | lb. |
|---|---|---|
| Mapledale Prolific | 54 | 0 |
| White Rice | 46 | 6 |
| Queen's Golden | 41 | 6 |
| Silver Lace | 39 | 45 |
| Black Beauty | 37 | 34 |
| Page's Striped Rice | 36 | 0 |
| Red Beauty | 29 | 50 |
| Average | 40 | 36 |

An average yield of 40 bushels per acre may be regarded as highly satisfactory. These are the best yields yet produced in the State with pop corn, and they show that this crop promises to be highly profitable for a few growers who will seize the opportunity that is offered. The pop corn manufacturers in Sydney were offering £1 per bushel for pop corn at the time of the latest inquiry, and one firm stated their willingness to give 22s. 6d. per bushel for Black Beauty variety.—H. Wenholz, Inspector of Agriculture.

# Dairy Produce Factory Premises and Manufacturing Processes.

## The Application of Scientific Methods to their Examination.

[Concluded from page 489.]

L. T. MacINNES, Dairy Expert, and H. H. RANDELL, Assistant to the Biologist.

### Example 4.

In the previous examples it has been demonstrated how butter and other dairy produce can be and are contaminated by bacterial agencies, which undo all the benefits derived from the neutralisation and pasteurisation of the cream. The manufacturing company in each instance had gone to considerable expense in installing and operating a pasteurising plant, and the manager and his subordinates had devoted much time and effort to improving their knowledge in order to manufacture the best quality butter—one that would not only be of choicest grade for immediate consumption, but would remain so after a considerable period of storage. They desired, in fact, to produce a choicest grade article suitable for exporting overseas, or for long storage for winter requirements.

It has been shown how these efforts were rendered unavailing, and that the official butter grade certificates disclosed that the quality had either already deteriorated or was rapidly doing so, in spite of everything that could be thought of to remedy matters.

In each case, however, practical bacteriological examinations, carried out in a thorough and systematic manner, have solved what seemed to the managers most difficult problems. The value to the industry of science thus practically directed in the manufacture of dairy produce has been so clearly demonstrated and put on such a sound basis, that general interest has been created on the part of those employed in dairy produce factories. So great has this interest become, that the Dairy Branch has repeated requests from managers that their factories should be visited for the purpose of similar investigations being carried out. These applications will be acceded to as soon as a favourable opportunity occurs, but meantime these articles (and also lantern lectures based on the results of the examinations therein described) have been the means of awakening those engaged in the manufacture of dairy products to the important part that bacteria take—for good or for the reverse—in the various manufacturing processes that are necessary to the production of high-class butter and other products of milk, all of which may be classed as more or less perishable.

The important part the factory buildings and surroundings play in causing inferior quality has been made evident in each of the examples already given. So far the factories described have been built many years—in two cases they

were very badly planned in the first instance for the purpose for which they were intended, and in the first case, neglect had accentuated these bad features until the whole premises had become nothing else than a means for distributing harmful organisms, thereby enormously re-infecting at every stage of manufacture either the cream or butter.

The moral it has been our endeavour to point is the need of the utmost watchfulness and care on the part of those controlling these factories in order to guard against re-infection, and the nullification of all the labour and expense involved in killing the dormant or undeveloped contamination which is to be found to a greater or less extent in every can of cream or milk as it is delivered from the farm to the factory. The dangers arising from the use of bad starters were shown in Example 2, and the need of a pure water supply in Example 3. We have also striven to drive home the need of having properly constructed premises for carrying out the manufacture of an article so susceptible to outside and surrounding influences as milk and its products.

It has been thought that it would be advisable to end this present series of articles with a description of the most modern and best constructed and planned butter factory in New South Wales.

This factory was only opened for use some fifteen months before we made our examination. It was planned to admit the maximum of light, to provide thorough ventilation, and to eliminate, as far as possible, all overhead floors, beams, pipes, &c., which act as collectors and distributors of dust and germs. Much attention was given to the matter of drainage and keeping the inside of the premises clean. The walls in the manufacturing rooms were lined with white opalite tiles, and all woodwork was covered with white enamel paint brought to a high finish. Beside having windows round the walls, light was freely admitted into each room through the roof by means of reinforced corrugated opaque glass sheets; the ceiling, which was also painted with white enamel, followed the contour of the roof, openings being made to correspond with the glass parts, and along the ridges of the roofs ventilators were installed.

A good idea of the whole structure, both inside and outside, can be gathered from the accompanying illustrations. In planning this factory the saving of labour was always kept in view. The total cost came to over £10,000, but the interest on this outlay has been more than met by the saving in labour and the improvement in quality that took place immediately the new premises were occupied. Previous to this it took thirteen men to cope with the work; now—with an increased output—nine are sufficient, with an individual minimum wage of £3 17s. 6d. per week. Further, the change from the old delapidated factory brought about a simultaneous improvement in the quality of the butter turned out—an improvement worth about 3s. per cwt. based on the condition of sales made under the imperial contract. It will be seen that the action of the directors in erecting this modern factory has been fully justified, and it has proved a most profitable undertaking to those engaged in dairying in that district. The factory is ideally situated

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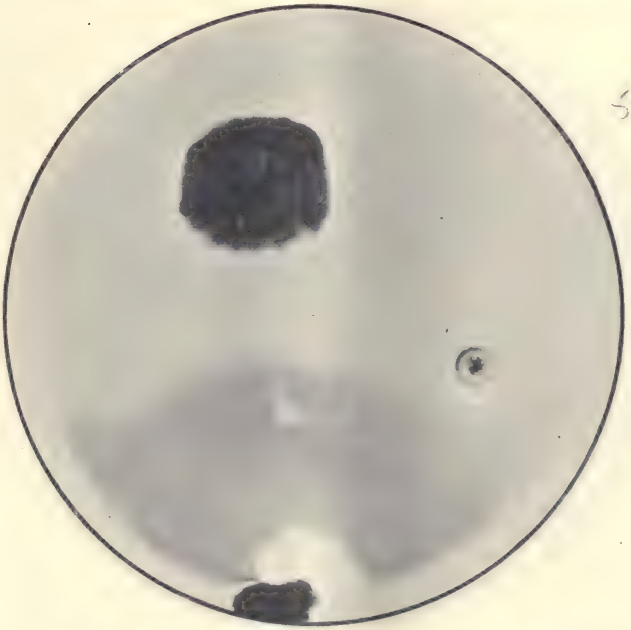
D1



Acid Agar Plate, atmospheric exposure for 2½ minutes in the cream receiving room of a modern factory. [Original.]

D2

Acid Agar Plate; atmospheric exposure for 2½ minutes in the butter room of a modern factory. [Original.]

D3

**Litmus Lactose Agar Plate, atmospheric exposure for 2½ minutes in the attemperator room of a modern factory.** [Original.]

D4

**Agar Plate, atmospheric exposure for 2½ minutes in the cheese-making room of a modern factory.** [Original.]

D5

**Litmus Lactose Agar Plate, atmospheric exposure for 3 minutes in the cold room of a modern factory.**

Note the large number of moulds. [Original.]

D 6

**Acid Plate Culture of butter wash-water (dilution 1 to 10).**

[Original.]

**Butter-making Room in a Modern Factory**

Ample provision has been made for light, ventilation, and sanitation.

**Cheese-making Room in a Modern Factory.**

from the points of view of sanitation and purity of atmosphere. It fronts a tidal river, and is bordered on the other three sides by green fields. The plate developed from a $2\frac{1}{2}$ minutes exposure under the cream vat platform, which is open to and on the same level as the churn room, gave no evidence of moulds or bacteria being present. The methods of making these exposures were similar to those described in previous articles, and the results showed that the premises and surroundings were remarkably free from infection—with one exception. The plate D5—three minutes air exposure in the cold room—shows that this room was much infected with mould. Mould was also found on the timber used for making butter-boxes, having evidently been brought into the factory from the timber mill and box factory. The room where this timber was stored in shooks, and where the butter-boxes were put together, adjoined the butter-making room, and an exposure made in the current of air flowing between the door from this room to the outlet on the opposite side of the churn room also showed the presence of mould organisms in numbers,

**A well-planned modern Butter and Cheese Factory on a Northern River.**

while the plates exposed on either side of this draught showed little or no growth—thus demonstrating how the spores were being carried right through the building and out the other side by the wind, after having been disturbed in the box room, perhaps while the infected timber was being shifted or while the different pieces were being nailed together. Possibly the force of the wind off the river was sufficient to lift the spores off the colonies growing on the wood, without the latter being moved at all. The boxes, after being filled with butter, were carried into the cold room and stacked almost to the height of the ceiling. At the time of examination this room was almost filled. In putting the boxes on the tiers, mould spores would be dislodged, and they were in the air at the time the exposure was made, with the result shown in D5. The manager of the factory was notified as soon as possible of what was taking place, and advised to close or re-arrange the connection between the timber storeroom and the manufacturing portions of the building, and to have the cold room emptied as soon as could be arranged so as to thoroughly

fumigate it or spray with formalin. He was also advised to destroy the moulds then on the butter-box timber before making up more boxes. It is understood these suggestions have been given effect to.

This is a striking illustration of how easily the newest and best planned dairy produce factory premises may be infected, and shows what an amount of watchfulness and care is necessary to keep everything connected with the manufacture of dairy produce free from sources of contamination. The factory manager must be ever on guard against re-infection.

### Water used in Manufacturing Butter.

In the present example the plate D6 indicates a water of unexceptionable purity, judging by the small bacteriological count. This is in marked contrast to other waters examined, notably in Examples Nos. 2 and 3 described in the previous articles. In the present case the water is obtained from a spring near the surface, the current draining rapidly into an excavated reservoir through a bed of water-worn coarse quartz gravel and sand. This reservoir is situated about half a mile from the factory, to which the water is brought through galvanised iron pipes by pumping. Good though this water is, it might be still further improved by filtering, in order to free it from sedimentary matter which will, as time goes on, accumulate more and more in such a length of pipe line.

While on the subject of butter-wash waters, it may be of interest to mention the case of another butter factory which had been in trouble for some time through the bad keeping quality of the product turned out. This is one of the several cases recently investigated and remedied to the satisfaction of the manufacturing company. Samples of water (taken from the source of supply—a well) were examined and found to be heavily polluted, among other organisms present being members of the coli and proteus groups—evidence of surface contamination.

The manager of the company, on being advised of the results of the first examination, caused shafts to be sunk in various directions round and more or less distant from the factory. Samples of the water thus obtained were sent to the Department, and on examination they were found to be similarly infected to the sample first sent in. On inquiry it was ascertained that this factory is situated in the midst of low-lying swampy country, the underground supplies of water evidently having soaked through the surface soil. The directors of the company have now decided to remove the factory to a site where a purer water supply can be obtained—a commendable step.

A good water supply is an absolute essential to the manufacture of good butter. Now that pasteurisation has been generally adopted in order to kill off or prevent the development of injurious organisms that have obtained access to the milk or cream, it is manifestly the height of folly to allow a fresh infection to take place by washing the butter in the churns with contaminated water. A water-filtering plant should form part of the equipment of every factory. In the majority of cases it would remedy matters; if not, a new and clean supply should be obtained if at all possible. Even if the factory had to be removed, it would be an expenditure well undertaken.

# The Score Card in Judging Live Stock.

H. W. POTTS, F.C.S., F.L.S., Principal, Hawkesbury Agricultural College.

It is difficult to define the qualifications of a good judge, and not an easy task to become one. The truth of the old axiom is readily admitted that judges are born, not made.

Actual and ripened experience in judging, associated with natural instincts, balanced reasoning power, quick perception, patience, confidence, honesty and firmness of purpose, combine to make a reliable judge—one who will gain the esteem of competitors.

Considerable misapprehension exists as to the proper use of the score card. It has been advocated for use by judges in the show ring, but it is out of place both on the show ground and in the sale ring. It is of no assistance in finally enabling a competent judge to determine the relative positions of two or more animals in the allocation of prizes.

Score cards have been designed by stud societies and teachers, however, to form standards of merit and to express numerically the degree of perfection in each part.

The judge may use the card as a basis to enable him more precisely to arrive at the various points of merit in a systematic manner. In this connection it materially assists him more clearly to explain to competitors the reasons for his awards, and thus establish an educational influence.

Where the score card is distinctly serviceable is in training students to judge in the classroom and stockyard. The study of the animal before it is estimated according to the points outlined on the score card is essential, but the constant practice in scoring trains the eye, strengthens the natural powers of judging, stimulates an accurate sense of observation and balance, and makes the study attractive. With such training, it is possible to acquire a reputation, and thus the student becomes a valuable asset in his district.

In order to place the use of the score card on a proper footing, and to bring out its practical application in developing judging on more thorough lines, the Council of the Royal Agricultural Society of New South Wales wisely determined to design and introduce a series of competitions at the recent Easter show. Its chief aim was to stimulate technical education in this direction for students attending agricultural colleges and high schools; also to train farmers' and graziers' sons as beginners in the art of judging. It often proves a valuable means of discovering latent ability.

The section worked admirably. The competitions proved interesting to both students and spectators, arousing a true spirit of rivalry among the youthful contestants, who realised the aims of the Society and appreciated its action.

The score card defines the official standard of excellence, and clearly states the normal appearance, significance, location, and value of each part and its bearing on function. Each part of the animal is examined and valued in contrast with the standard of excellence.

Prior to using the card, personal investigation should be employed. The eye of the student is the most potent factor in determining first impressions. Should the subject for judging be a horse, then the student subjects him to keen scrutiny and views him critically from every standpoint, both at rest and in action, taking pains to detect and note points of merit as well as demerit.

Quality, style, conformation, temperament, soundness, action, and other features all have to be estimated. In support of the eye's examination the hand may be used to confirm suspicions, or define a quality or fault. This is followed by filling in the column of points in the score card in contrast with that giving standard points.

It is good practice first to detect and estimate the prominent defects, and in doing so to adopt a general rule never to deduct more than one-half the points or 50 per cent., or less than a quarter-point. A perfect animal scores 100 points, a choice one approximately 90 points, and a good animal not less than 80 points. The class in which a horse is placed indicates his use—such as draught, harness, or saddle horses. The economic use of each should be noted. Skill and confidence can only be attained in the use of the score card by constant practice, not only in scoring of breeds, but also in scoring animals of different ages in one class and noting features and parts where they differ from mature animals.

When the pupil has reached the stage of efficiency shown to be of sufficient merit then the score card may be rejected.

To briefly summarise, it will be seen that the score card is used for educational and cultural influence to enable the student, with precise steps and in logical order, to detect and assemble the values of desirable qualities as well as faults, and to record figures representing the degree of perfection in each part or section. This encourages the habit of methodical and keen observation, the art of quick perception, and the acquisition of mental impressions.

Under this system of teaching efficiency must grow rapidly, and a higher range of thoroughness be acquired.

By constant use of the card the student is trained to make methodical and defined observations, and his mental impressions are corrected and reinforced; he gains confidence, and eventually emerges as a judge competent to explain to a critical audience of competitors the reasons for his awards It is not in any degree suggested that the score card should supersede or alter existing methods in judging. The score card may be looked on primarily as an aid to training the student, and to ascertaining his capacity for assuming the responsible duties of a judge.

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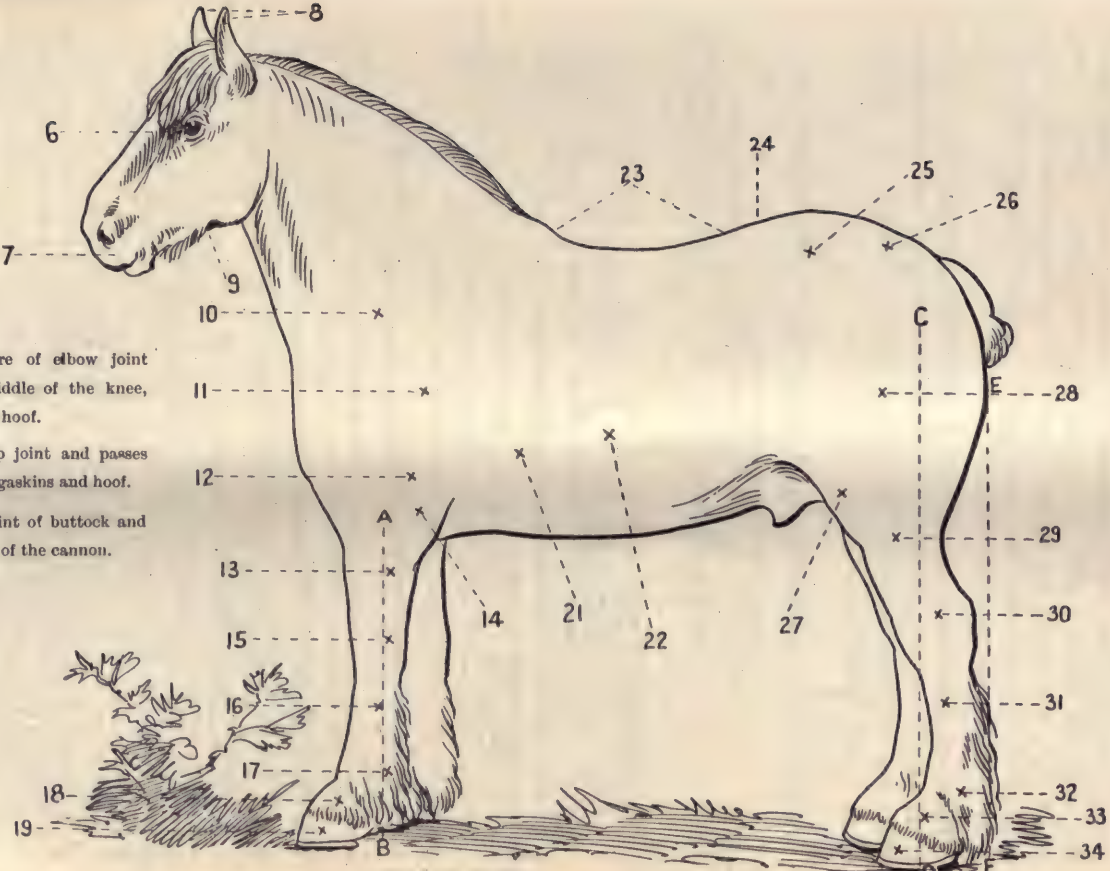
**Students of Hawkesbury Agricultural College using the Score Card in a judging competition at the R.A.S. Show, Easter, 1920. Principal H. W. Potts on the extreme left.**

The Prizewinners of the Score Card Judging Competition at the Easter Show, 1920.

Line AB drops from centre of elbow joint and falls opposite the middle of the knee, pastern joint, and back of hoof.

Line CD drops from the hip joint and passes through the centre of the gaskins and hoof.

Line EF drops from the point of buttock and runs parallel with the line of the cannon.




**A Clydesdale Stallion.**

The numbers refer to the score card on pp. 570–1.

The necessity for placing judging on a more scientific basis is being felt all over the world. Stock and produce of all classes are improving in quality and character, and the task of securing competent judges is felt in every direction, so that the move made by the Royal Agricultural Society of New South Wales to encourage our young people to render themselves competent is distinctly meeting a public demand.

The accompanying score card for a Clydesdale stallion is in use at Hawkesbury Agricultural College, and is reproduced in the hope that it will be of use to students and others who have not access to the methods adopted at this institution.

## HAWKESBURY AGRICULTURAL COLLEGE STUDENT'S SCORE CARD.

## CLYDESDALE STALLION.

| SCALE OF POINTS. | Maximum Points. | Student's Estimate. | Instructor's Estimate. |
|---|---|---|---|
| **GENERAL APPEARANCE—16 points, as under :—** | | | |
| 1. WEIGHT (according to age) .. .. .. .. .. .. .. .. | 4 | .......... | .......... |
| 2. SYMMETRY—Broad, clear outline ; massive and well proportioned ; game and active, with smart distinguished bearing .. .. .. .. .. .. | 4 | .......... | .......... |
| 3. QUALITY—Fine, clean bone, ample substance ; silky feather, not profuse ; well-defined tendons and good skin .. .. .. .. .. .. .. | 4 | .......... | .......... |
| 4. TEMPERAMENT—Alert, docile disposition, energetic and tractable .. | 4 | .......... | .......... |
| **HEAD AND NECK—7 points, as under :—** | | | |
| 5. HEAD—Moderate size, well carried, full broad forehead, tapering up towards the base of the ears, flat face .. .. .. .. .. .. | 1 | .......... | .......... |
| 6. EYE—Full, placid, round, bright, with an expression of kindliness and vigour .. .. .. .. .. .. .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 7. MUZZLE—Wide, rather square ; roomy, open nostrils ; neat, muscular, elastic lips .. .. .. .. .. .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 8. EARS—Long, fairly large, set smartly .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 9. LOWER JAW—Deep, broad, angles wide, space between free and clean for windpipe .. .. .. .. .. .. .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 10. NECK—Strong, muscular, medium length, showing more crest than other breeds ; large windpipe and fine throat latch .. .. .. .. .. .. | 2 | .......... | .......... |
| **FOREQUARTERS—22 points, as under :—** | | | |
| 11. SHOULDERS—Strong, muscular, moderately sloped, with broad bearing surface, and close topped .. .. .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 12. ARM—Strongly muscled, short, thrown forward, keeping the foreleg straight and well under the chest .. .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 13. FOREARM—Muscular, broad, and long .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 14. ELBOW—Strong, clean, and set close into the body .. .. .. .. .. | 1 | .......... | .......... |
| 15. KNEES—Large, flat, straight, and deep .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 16. CANNONS—Strong, dense, flinty bone, viewed from front or side tapering towards the back of the leg ; tendons hard, thick, clean, and distinct .. | 2 | .......... | .......... |
| 17. FETLOCKS—Large, wide and strong .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 18. PASTERNS—Long, sloping and strong .. .. .. .. .. .. .. | 3 | .......... | .......... |
| 19. FEET—Symmetrical, solid, large, round, squarely placed ; heels wide and clearly defined ; horn dense, soles concave, bars strong and large, frogs elastic ; coronets wide and round in proportion to the legs ; the hoofs should spread as they descend from the coronet.. .. .. .. .. .. | 5 | .......... | .......... |
| 20. LEGS—Normally placed and straight, neither inclining inwards or outwards at the knee. To test this from a front view, suspend a plumb-line from the point of the shoulder ; it should fall opposite the centre of the knee, cannon, pastern and hoof. At the side, a plumb-line dropping from the centre of the elbow joint should fall opposite the middle of the knee, pastern joint, and back of hoof. There should be a fine growth of soft, silky, straight hair, forming a fringe from the back of the knee down the leg to the pastern joint. The front of the leg and fetlock joint must be clean and smooth .. .. .. .. .. .. .. .. .. .. .. | 3 | .......... | .......... |
| **BODY—8 points, as under :—** | | | |
| 21. CHEST—Well-developed, wide, low, capacious and deep, with a large girth, high withers and full bosom .. .. .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 22. RIBS—Fore-ribs well sprung and deep, giving ample room for heart and lung action ; back ribs deep, round and well let down, forming a round barrel and short coupling .. .. .. .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 23. BACK—Short, level, broad and muscular .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 24. LOIN—Wide, level, short and muscular .. .. .. .. .. .. .. | 2 | .......... | .......... |

STUDENT'S SCORE CARD. CLYDESDALE STALLION—*continued.*

| SCALE OF POINTS. | Maximum Points. | Student's Estimate. | Instructor's Estimate. |
|---|---|---|---|
| **HIND-QUARTERS—33 points, as under :—** | | | |
| 25. *HIPS—The bones well apart, symmetrical and smooth.. .. .. .. .. | 2 | .......... | .......... |
| 26. CROUP—Level, muscles strongly developed, tail well set on and carried freely .. .. .. .. .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 27. STIFLES—Strong, muscular and well apart .. .. .. .. .. | 2 | .......... | .......... |
| 28. QUARTERS—Well-turned, broad, deep, heavily muscled, and low set .. | 2 | .......... | .......... |
| 29. GASKINS OR LOWER THIGHS—Prominent, long, wide, and muscular .. | 2 | .......... | .......... |
| 30. HOCKS—Points well defined and clean cut, strong, not fleshy, muscular and straight .. .. .. .. .. .. .. .. .. .. | 8 | .......... | .......... |
| 31. CANNON BONES—Broad near the hock, and tapering towards the back, stout, clean, with large tendons, clearly defined, and set well back .. | 2 | .......... | .......... |
| 32. FETLOCKS—Strong, wide, clean .. .. .. .. .. .. .. .. | 1 | .......... | .......... |
| 33. PASTERNS—Oblique, long and strong .. .. .. .. .. .. .. | 2 | .......... | .......... |
| 34. FEET—Moderately deep, large, even size, dense horn, concave sole, large elastic frog; heel wide, high, one half the length of toe; hoof to spread evenly downwards from the coronet .. .. .. .. .. .. | 6 | .......... | .......... |
| 35. LEGS—A plumb-line suspended from the hip joint at the side should pass the centre of the gaskins and hoof. Again, a plumb-line hung from the point of the buttock should run parallel with the line of the cannon. The points of the hock must be carried closely together, somewhat inclined inwards. A soft, straight, silky fringe of feather should extend along the back of the cannon to the pastern .. .. .. .. .. .. .. | 4 | .......... | .......... |
| **ACTION—14 points.** | | | |
| 36. WALK—Light, springy, smooth, quick, long stride, and balanced well, step firm and brisk, feet lifted well, showing the full sole, and placed squarely on the ground. Smart, even shoulder and knee action. The hind leg is lifted smartly, sent far and sharply forward, and brought firmly and squarely to the ground. The heels to be slightly inclined inwards and and toes outwards .. .. .. .. .. .. .. .. .. | 8 | .......... | .......... |
| 37. TROT—Rapid, free, nimble, even and regular, with a gay, smart bearing .. | 6 | .......... | .......... |
| Total .. .. .. .. .. .. .. | 100 | .......... | .......... |

## The Tenacity of Prickly Pear Seedlings.

Readers of the *Agricultural Gazette* will perhaps remember a short article in the issue of February, 1919, which drew attention to the manner in which the seeds of prickly pear are carried by emus, and how they germinate in the masses in emu droppings. The seedlings illustrated in the *Gazette* of that date have since provided very convincing evidence of the persistent vitality of the pest. After the photographs were taken for those illustrations, the specimens were allowed to lie in a glass tray in the room of the Government Printer's artist, entirely neglected at first, except that on perhaps two or three occasions the dregs of a cup of tea were thrown over them. As their tenacity began to arouse interest, however, they were left severely alone, and for long over twelve months were without a drop of moisture. . Their first healthy green shoots as they failed, put forth at the tip smaller second shoots, and then from the end of these second, third tiny shoots—thickly protected with spines—appeared, and finally withered off.

On 27th May of the present year it was observed that all the seedlings but one were dead; it was not until the end of June that the whole were solemnly pronounced to be dead—more than eighteen months after they had been germinated for the purpose of the illustrations of February, 1919.

With such a capacity for existence without moisture, even in the seedling stage, is it any wonder that the pear defies all ordinary efforts at control, or that it spreads so steadily and irresistibly?

# Safeguarding Farm Stock from Disease.

## (2) By Good Hygiene.

[Concluded from page 518.]

MAX HENRY, M.R.C.V.S., B.V.Sc.

### The Importance of Cleanliness.

As important as structure in connection with housing is cleanliness. Faulty structure is often responsible for much uncleanliness, especially in the case of pigsties and calf-pens, and it is just in connection with these two animals that the heaviest losses associated with lack of cleanliness are observed. Yet the buildings in which animals are housed are frequently so constructed that every impediment is put in the way of men cleaning them out—even where the wish to do the work thoroughly is present.

The commonest diseases spread or indirectly produced by lack of cleanliness are diseases of horses' feet, digestive disturbances in calves and pigs, and wound infections that include tetanus and malignant œdema, skin diseases, and necrosis. In nearly all these diseases infection is caused by contamination of floors of sheds and yards by micro-organisms, and this is best illustrated in the case of calf-pens and sheep yards. Valuable as has been the saving work of vaccination in connection with livestock, it would probably be just to observe that cleanliness would have saved more lives and reduced inefficiency more than all the vaccines put together. Unfortunately, the vaccine is looked on as a wonderful mystery and is a source of income to many who advocate its use, whereas the advocacy of cleanliness does not help anyone financially, and no one can pretend there is any mystery about it. If, however, the dairy-farmer will consider the number of cases of diarrhœa, dysentery and ringworm and the loss caused by them in his district, the sheepowner the loss from tetanus and other wound infections, and the horse-owner the amount of lameness and inefficiency caused by thrush and canker, and will recollect that all these are intimately connected with lack of cleanliness and sanitation, the importance of the matter may be brought home to them.

The methods required in cleansing floors and yards have been referred to in various places, but one point may be stressed here—too great a reliance must not be placed on disinfectants, especially where the floor is of earth. For concrete floors, the scraping up and collecting of all visible dirt and a thorough swilling with water followed by sweeping is the best measure; if the water is hot and some disinfectant is added so much the better, but the most essential part is the scraping and washing down. For earth floors, especially in such places as sheep pens, where the dung may be a couple of inches thick, disinfectant is of little use.

In fowl-runs, cleanliness is of most marked import in the prevention of tuberculosis, fowl-cholera, and various other infectious and parasitic diseases.

The use of limewash (particularly if it is applied hot and a small quantity of carbolic acid added) is of value in all wooden buildings occupied by stock or birds.

### Adequate Shelter a Neglected Necessity.

There is one point in the hygiene of domestic animals which is very seriously and widely neglected—that is the provision of shelter. It is not altogether surprising that such is the case, since a very large proportion of our stock are paddock-run for the whole of their existence, and the shelter of such timber as the paddock may contain is usually regarded as sufficient. In many cases this shelter actually is sufficient; but with the continued clearing of land and subdivision into smaller areas, cases are becoming more and more frequent of stock being exposed, both summer and winter, in paddocks destitute of shelter of any kind. With the increase in the value of stock—which, although it may be temporarily deferred by drought, is inevitably coming—every means possible to ensure greater efficiency, whether in the production of work, wool, flesh, or milk, must be taken advantage of.

Shelter is required from sun, wind, and rain. Shelter from the sun is perhaps the least important, although many cases of dermatitis in sheep, cattle, horses, and pigs are due to the sun's action under certain circumstances; and it is not to be denied that calves and pigs especially suffer in their general health from the direct action of the sun's rays if confined at the same time in small pens. Sheep give very evident signs of the benefit of shelter from the sun by their habit of crowding together into any patch of shade available during the mid-day heat of summer. The destruction of much of the natural shade is due to the landowner's wish to obtain grass, but he will be well advised to make a more judicious allowance for shelter, since the loss due to the effects of heat may go some way to minimise the benefits obtained from increased feed. It is all a question of proportion. There is no doubt that up to the present a due proportion has not been maintained, and too little natural shelter is left in many cases.

Similar instances may often be seen in large horse camps attached to railway construction camps and other places, where the horses are often confined during their time of rest in small paddocks exposed to the full glare of the sun. Shelter from the sun is best provided by standing timber, and where the land is not already over-cleared consideration should be given to the matter. Where it is already bare, the planting of a few trees in well-selected spots will be of incalculable benefit in a few years' time. That this is not altogether forgotten is evidenced by instances, noticed recently, of a wise planting of trees in and around sheep yards and similar places. For small horse paddocks, only temporary in nature, the provision of brush and bark shelters could often be made at little expense. In other places the provision of a shelter-shed with one side (that to the prevailing wind) closed would be of considerable benefit.

Stock do not suffer very greatly from exposure to rain alone, although scalding may take place in long-continued wet weather; young animals may suffer loss of condition from the same cause. Nothing reduces stock so rapidly as continued exposure to cold biting winds, and shelter from these is of very great importance. Even where animals are suffering the severest exposure, such as occurs with horses on horse lines in wet, cold winters, much of the ill effect can be reduced by the simplest kind of windbreak. Debility and exhaustion cause very heavy losses among horses under such conditions, and the wind is probably one of the most serious factors. The disease-resisting power of the animal is also considerably reduced.

Probably one of the most serious economic losses from exposure in this country is the reduction in the milk supply of dairy cows.

Standing timber is again the most suitable protection, and should be so left as to provide a windbreak from the direction of the prevailing winds; but shelter sheds and the lee side of farm buildings may be utilised, or hedges can be grown along exposed sides of small yards.

### The Hygienic Disposal of Excreta.

This question is only considered of importance in the case of animals on small holdings, and yet at times the sheep on the biggest runs may be more or less affected with disease associated with the disposal of excreta. Certainly it is rarely that it will be so, and in the vast majority of large holdings the matter has no practical significance. The small farmer has to consider the question from two standpoints—firstly, the effective use of the excreta on his cultivated land, and secondly, the prevention of disease among his livestock.

So far as horses are concerned but little need be observed, except to emphasise the ill results of allowing them to stand in a mixture of mud, dung, and urine, and to point out that horse manure appears to be a peculiarly favourable breeding ground for flies, and should therefore be got well away from stables, cow-sheds and houses, and dealt with by close packing or covering with earth or in other ways to minimise its attraction. When circumstances do not permit of open drains in the stable for the removal of liquid manure, care should be taken that the existent drains are properly trapped and ventilated to prevent the return of foul gases into the building.

In cow-sheds the liquid manure is preferably removed by a wide and shallow drain at the back of the cows. Solid excreta should be removed regularly from the bails and yard, and stacked or pitted preparatory to its use on the land.

Sheep yards and pens should be cleared of excreta to prevent infection of lambs at marking and of sheep after shearing.

It has been shown that tuberculosis may be readily contracted both by cattle and pigs from grazing over land which has been heavily manured with the excreta of tubercular cattle. This fact emphasises the desirability, where practicable, of disposing of the dung on land to be cultivated; and in

small paddocks, where a fair number of cows are confined, of breaking up the clods and heaps of dung for the purpose of fully exposing it all to the sunlight. Both measures must very sensibly reduce the risk of infection.

In a previous article the possible spread of anthrax through the fæces of dogs and other animals was referred to, but except in very rare cases nothing can be done to prevent this. Swine fever is largely spread through the agency of the fæces and urine, the latter especially containing the infective virus—hence the necessity of good drainage, preferably into a cultivation paddock and not in the direction of other pigsties. The organism of tetanus is present in the dung of herbivorous animals to such an extent as to render almost every dirty stable, cow-shed, and sheep yard a possible source of infection. White scour in calves has been ascribed on good grounds to infection through the umbilicus by the fæces of already infected animals.

The danger arising from the flies bred in manure and dung heaps is one more particularly applicable to human beings, but since the infection of milk by flies is quite within the range of probability the necessity of removing all accumulations of dung to a reasonable distance from milk rooms must be mentioned. The irritation to which animals are subjected by flies is not without its influence on their condition. Recent research has shown that certain parasites of horses and cattle, notably the worm producing worm nodules in cattle and that producing tumour-like growths in the stomachs of horses, are fly-borne. The extreme probability that ophthalmia as seen in stock in this country may be carried from animal to animal by flies of one sort or another, renders it all the more requisite that excreta should be dealt with in such a way as to reduce the breeding of those pests as much as possible.

### Grazing: The Danger of Overstocking.

All that needs to be said in respect to grazing might be put into three words: Overstocking is dangerous. It may be laid down as a rule to which there is practically no exception that the increase in the risk from disease occasioned by overstocking is out of all proportion to the increase in the number of stock added to those already on a given area. This increase in risk involves three types of disease—infectious, parasitic, and dietetic. The chances of infectious disease spreading is of course obviously greater where animals come into more direct contact with one another, and the longer such contact is continued the greater the risk. Since in most instances of parasitic infestation the eggs or embryos of the parasites are passed out of the animal with the fæces, it is equally obvious that the more stock are crowded together the more they will tend to become re-infected with the parasites.

Dietetic diseases are in most instances only to be expected when overstocking is continued for a long period; such diseases are sometimes so delayed in their appearance, and the exhaustion of the soil by overstocking is also so gradual that it is difficult at first sight to connect the two, but the connection undoubtedly exists. This refers to overstocking of a whole

holding. It is, of course, often economically sound and wise from a health point of view temporarily to overstock some portion of a holding, even to a very marked extent, and then to allow that portion a rest from stocking. Changes such as this practice leads to benefit both stock and pastures.

The danger from crowding many stock together on small areas is most marked in the case of young stock—particularly calves. Concerning the dangers peculiar to grazing on certain types of country, mention may be made of paddocks particularly subject to blackleg, of swampy and low-lying country likely to favour the development of parasites, and of small areas on which certain markedly noxious plants may be growing. In dangerous areas of the first type, spelling, or better still, cultivation, have been found beneficial; in the second, draining, cultivation and fencing-off may be utilised; and for the third, either the cutting of the plant or the interference with its accessibility for stock. When the lastnamed measures are impracticable, much loss may at times be saved if, when the stock first get on to the area they are watched carefully and instantly removed on the first sign of sickness. Instances, too, are not wanting where loss has followed the deliberate disregard of warnings issued by competent authorities.

## What a Co-operative Dairy Society Achieved.

The value of co-operation and the advantage of combining some animal industry with farming are both exemplified by the history of the Camelford and District Co-operative and Dairy Society, England. According to the *Journal of the Ministry of Agriculture*, London, Camelford is a district in North Cornwall where very little milk was produced previous to 1917, in which year a co-operative school was held at Camelford. This school resulted in the formation of a co-operative society, and the following are the data showing the quantities of milk dealt with:—1917, 30,000 gallons; 1918, 64,000 gallons; 1919, 108,000 gallons.

It is claimed that the increases in the quantity of milk dealt with by the society are entirely attributable to increased cow-keeping in the district, and it is further reported that notwithstanding the fact that the milk was either sold as milk or made into dairy produce, the number of stock raised in the district has also been increased; and the whole is taking place without any reduction in other farm produce.

## Plants of the Mexican Apple.

A few plants of the Mexican Apple (*Casimiroa edulis*) described in the *Agricultural Gazette* for February, 1918, by Mr. E. N. Ward, Superintendent, Botanic Gardens, Sydney, are available, and any grower who would care to test one in a coastal district is invited to make application for one. No charge will be made, and applications will have to be dealt with in the order in which they come to hand. Letters should be addressed: Under Secretary and Director, Department of Agriculture, Sydney.

# Orchard and Garden Mites.

## No. 1. Blister Mites (Family *Eriophyidæ.*)

W. W. FROGGATT, F.L.S., Government Entomologist.

There are several groups of destructive little creatures known as mites. Though not true insects, they are often serious pests in the garden and orchard, where, on account of their rapid reproduction under favourable climatic conditions and their small size, they may do a great deal of damage before they are discovered.

Mites belong to the *Acarina*, a well-defined group of the *Arachnida*, which also includes spiders, scorpions, and ticks. They are distinguished from true insects by the number and structure of their legs; while insects always have three pairs, mites may have either three pairs or two. The head and thorax of an insect are distinctly separated, and with the abdomen, form three divisions, but the head and thorax of a mite are solidified together, and the whole is known as the cephalothorax.

Many species are cosmopolitan, and they have been spread far and wide in the leaf buds of their plant hosts or in the egg stage on the bark. They are divided into a number of well-defined families; of these, the blister mites and the spinning mites are well known to the gardener and orchardist.

### The Leaf Blister Mite (Family *Eriophyidæ*).

The members of this family are all so minute that they require to be studied with a high-power microscope to obtain any details of their structure. They bury themselves in the skin of the fruit, and either discolour and crack the surface, produce a thickening of the tissue of the leaves, or form blister galls or erineum, composed of masses of deformed hairs on the surface of the leaves and known as *acaro-cecidi*. Banks has figured and described these structures under the names dimple galls, pouch galls, capsule galls, nail galls, rib galls, and blister galls, according to their form. Several of our eucalypts have their foliage thickly encrusted with patches of crimson capsule galls, probably due to the presence of similar mites. In most of the earlier works upon blister mites, they were placed in the genus *Phytoptus*, formed by Dujardin in 1851; but it has recently been discovered that Siebold, working on the same group only a year before, had created the genus *Eriophyes* for their reception; so, by the recognised law of priority, this name now displaces that of *Phytoptus*.

From their curious, elongate fusiform shape and the fact that they only had two pairs of legs, the entomologists who first discovered the makers of the galls came to the conclusion that they were not adult, but some active, eight-legged mite in the immature stage. It is quite a common thing to find specimens of eight-legged mites sheltering on the under-surface of foliage infested with blister mite, so it was not an unnatural mistake.

**The Pear-leaf Blister Mite.** (*Eriophyes pyri*, Pagenstecher).

This is a well known cosmopolitan pest upon the foliage of the pear tree. Hibernating in the bracts of the leaf buds, it attacks the tiny unfolding leaves, causing them to develop variegated reddish-green blisters, which, as the leaves mature, become brownish-black patches of thickened tissue spread all over the leaf. In these the full-grown mites shelter; they emerge through a minute opening on the under-surface of the infested leaf. The adult mites are white, of the typical cylindrical form, with the two pairs of short legs on the hind margin of the head. They are just noticeable to the naked eye when moving out of the gall, and measure about $\frac{1}{25}$ of an inch.

This mite was described from Germany in 1857, and it is common in England. Miss Ormerod, in her account of this orchard pest ("Handbook of Orchard and Bush Fruit Insects," p. 127), reproduces Nepaula's figure of it, and states that she could always get specimens for study in her orchard. It was probably introduced into the United States from Europe at a very early date, as it was identified and described from that country in 1872. Dr. James Fletcher states that it does a considerable amount of damage in Canada. We have no early record of its introduction into Australia. Fraser Crawford noted it in South Australia in 1881; French, in the first part of his "Handbook of the Destructive Insects of Victoria," records it from that State in 1891; and Dr. Cobb noticed it in this journal in the same year, giving in the year following a woodcut and general account of it, and pointing out that it might often be mistaken for pear-leaf scab (*Fusicladium pyrinum*). As the treatment of these two leaf pests is very different, their identification is important. Dr. Cobb showed that they could be distinguished from each other when examined through a low-power lens, the mite galls being furnished with a small opening which the fungus galls lack.

Experiments, carried out at Cornell University by Professor Slingerland, show that the pear-leaf blister mite can be easily controlled by spraying with kerosene emulsion, diluted with from five to seven parts of water, any time after the leaves have fallen. At this time all the mites will have left the dead and dying leaves, and will be wintering in the bracts of the leaf buds before attacking the opening leaves in the coming spring. If the spraying is carefully carried out, and every bud drenched, all the mites will be killed by the oil. This mite is not uncommon at times in our pear orchards, particularly in the southern districts, but is seldom plentiful enough to defoliate the trees as it is said to do in other countries.

**The Vine-leaf Blister Mite** (*Eriophyes vitis*, Landois).

A native of Europe, this mite was accidentally introduced into the United States, and according to Essig is now found in all the vine-growing districts of California. It probably came across the Pacific to this country, and is certainly a recent introduction—probably of the last ten years. During the last two, however, it has spread all through the vineyards of the county of Cumberland; many specimens of blistered leaves were forwarded to the Department during the last summer.

The blisters on the infested leaves are due to the presence of numbers of tiny microscopic elongate cylindrical mites, which, wintering in the bark or bracts of the leaf buds, crawl out on the expanding leaves and puncture them as the leaf reaches maturity. The colonies of mites congregated in the blisters cause the aborted tissue to turn yellow or brown. These mites are white, and very similar in general form to those that blister pear leaves. They have only two pairs of legs, and these are situated close behind the head. The mites are so small that only with the aid of a good lens can one observe their movements. In the earlier stages of the gall development they are very difficult to make out; but, as the leaves and galls mature in March and April, the mites emerge from the mass of deformed hairs filling the blister, and can be easily noted under the microscope.

Essig says: "Sulphuring the vines early in the spring, soon after the buds open, as is ordinarily applied for mildew, is usually sufficient to hold the mite in complete subjection." Spraying with kerosene emulsion as recommended by Slingerland and the burning of all vine cuttings from infested vines would also be effective.

**The Silver or Orange Rust Mite.** (*Phyllocoptes oleivorus*, Ashmead).

This mite is a native of Florida, where it lived originally upon the wild citrus trees of the forests; it was described by Ashmead and included in Hubbard's "Insects affecting the Orange." It was accidentally introduced into California with nursery stock, and though it has not spread much from the original area in which it was first discovered, it is found, according to Higgins, in the Hawaiian Islands. The writer saw oranges and grape-fruit deeply discoloured by its presence in the citrus orchards of Cuba and Jamaica.

This mite takes the first of its popular names from the curious silvery sheen on the skin of the infested lemons before they ripen; this, later on, gives place to a network of cracks all over the rind as it hardens. When the rind of the orange is attacked it assumes a russet tint; this discolouration of the skin (due to the presence of the tiny mites embedded in the surface) is identical with that known in Australia as "Maori disease" of oranges.

Olliff discovered the mite upon oranges from an orchard at Emu Plains in 1891. He identified it with the orange pest described by Hubbard, and noted in the pages of this journal its presence in Australia. Under the heading of "Orange Rust Mite or 'Maori'" he reported in the following season (*Gazette*, vol. ii, page 671), the successful application of sulphur and soap wash at the infested orchard. This is one of the smallest mites, and is very difficult to separate from the tissue of the skin of the fruit. Though Olliff's identification is doubtless correct, the writer finds it difficult to believe he found the mites in the discoloured orange skin. Hubbard, however, states that he collected them in large numbers when they were away from the fruits resting on the leaves.

Though infestation by this mite is still often noticed in our orchards, it does not seem to be a very serious citrus pest in Australia.

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## TO PROTECT SEED MAIZE FROM RABBITS.

"Do your officers know of any treatment for maize seed that would make it distasteful to rabbits, bunny having learned to take the corn in the same manner as kangaroo rats do?" The question occurred in a letter from a Glen Innes correspondent, to whom the reply was:—

The process used on the North Coast to protect maize planted adjacent to scrubs from such animals as kangaroo rats, bandicoots, &c., is to smear the seed with coal tar. This is best done by immersing the seed first of all in fairly warm water, and then draining off the water and quickly adding the tar at the rate of about a small cupful to a bushel of corn. The seed should be thoroughly mixed with the tar so as to ensure every grain being coated. Slaked lime or dust can be used for quick drying and the seed is then quite ready for sowing in a drill.

Poison baits of phosphorised pollard laid on the ground about a week before sowing ("dummying" or baiting without poison for a while beforehand until a good "catch" is assured) will also help considerably.

If the rabbit follows the furrows along like the kangaroo rat, it is a wise precaution to obliterate the planter rows by cross-harrowing.


**Vine Leaves Infested with the Vine-leaf Blister Mite.**

1. Under-surface of leaf, showing depressions caused by blister galls.
2. Upper-surfaces of leaves, showing galls.


**The Vine-leaf Blister Mite (*Eriophyes vitis*). (Inset, the under-side of the foot.)**

[See page 578.]

**An Abnormal Condition resembling Peach Rosette.**

[See page 581.]

# A Condition resembling American "Peach Rosette."

W. A. BIRMINGHAM, Biologist's Assistant.

In March, 1920, peach twigs with abnormal foliage were submitted to the Biological Branch for the determination of a suspicious condition and its treatment. The condition resembled very closely that of "peach rosette," which is prevalent in some parts of the United States of America, but which has not been met with in this State before.

Critical examination of the material failed to reveal the presence of any organism, and the grower was asked to submit further specimens and to state whether he had noticed the fruit fall prematurely. He was unable to do either, as the trees had only been budded the previous season with wood obtained from America. Sufficient time had not elapsed to enable the trees to present the other characteristics of rosette, namely, the yellowing of leaves in early summer, and the premature dropping of the fruit.

The condition must be regarded as a very suspicious one, on account of the bunching condition of the leaves and the fact that the wood with which the trees were budded was imported from America.

It would be impossible to detect rosette or "peach yellows" (a condition closely allied to it) in imported wood—a fact that emphasises the necessity of keeping a close watch on trees budded with wood obtained from America, in order that the introduction and spread of disease may be prevented.

Rosette was first observed in Georgia in 1879, and was first thought to be yellows. It was later found in other States—Kansas, South Carolina, Arkansas, and elsewhere.

Rosette differs from yellows in having the bunches with narrow leaves and the internodes quite short, so as to bring the leaves in bunches or rosettes along the branches and at the ends of the twigs.

It acts quickly, killing the diseased trees in six to twenty-four months. It generally shows when the buds first open in spring, and when the leaves are older they have a stiff appearance and inrolled margins. The affected foliage turns yellow early in the summer, and the fruit falls prematurely.

The cause is not known, but, like yellows, rosette is probably due to a filter-passer, that is, an organism which our highest magnifying lenses would fail to detect. The disease is contagious, and can be spread by buds from diseased trees and by root grafts. It seems that if the smallest piece of living matter from a diseased tree is established on a healthy one, the disease will follow.

It is supposed to be also spread from tree to tree in the orchard in some other way not yet discovered. This supposition is based chiefly on the fact that where diseased trees are removed as fast as they appear, there is a much smaller total percentage of trees lost than where they are allowed to remain. The disease also seems to extend gradually from centres where it first starts.

The treatment recommended is to destroy trees by burning before the leaves have fallen, as there are indications that even the leaves may carry the disease. Any orchardist who observes a condition resembling that illustrated would be serving himself and his neighbours by communicating with the Department, especially where there is reason to believe that the wood is American.

## Elephant Grass as a Pasture.

Results obtained from grazing a small plot of Elephant grass at Wollongbar Experiment Farm led to an area of 2 acres being planted last spring for a more extensive trial. The land selected had been previously under Elephant grass, but it was well prepared, and on 20th October, 1919, cuttings were planted 3 feet apart in rows that were 4 feet apart. About 60 per cent. of the sets grew, which was considered satisfactory under the dry conditions prevailing; the vacant places were replanted on 25th November.

The growth was good, and on 3rd, 4th, and 5th January, 1920, fifty-six head of milking cows were agisted for five hours each day. Their milk yield had been measured on 2nd January, 96 gallons being recorded, but on the three following days on the Elephant grass they gave 108, 113, and 111 gallons, which was equal to over a quart increase per cow per day.

On 19th March forty-one head of milkers were again turned in, their 69 gallons of milk on the previous day increasing to 73 gallons in response to the improved fodder.

On 21st May a third trial was made with twelve milking cows, whose yield was increased by ½ pint for the day. The weather was cold and the cows were rugged on this occasion so that good results could not be expected.

A noticeable feature of the trials was the fine growth sent up after the first and subsequent grazings.—A. H. Haywood, Manager, Wollongbar Experiment Farm.

## The Future of Agricultural Machinery.

The report of the Departmental Committee on Agricultural Machinery [Ministry of Agriculture, England], may be considered to mark a new epoch in British farming. It is a recognition of the fact that old-fashioned methods will no longer suffice, and that if our food production is to be brought to the utmost point of efficiency the farmer must employ the best mechanical power as an auxiliary to the skill which he has acquired by centuries of tradition. Not only must he have at his command machinery of the highest excellence, but he must know how to make the best use of it. By this means alone will it be possible to reduce the costs of production upon which the price of the nation's food depends.—*Journal of the Ministry of Agriculture*, London.

# "Bunchy Top" in Bananas.

G. P. DARNELL-SMITH, D.Sc., F.I.C., F.C.S.

THE external signs of "bunchy top" are well known, but it may be advisable to call attention to some internal signs.

Healthy banana tissue, both of the corm and of the pseudo-stem, is almost dead white when first cut across. It may, of course, turn to purplish colour on the outside soon after it has been cut with a steel knife, owing to the action of tannin and the formation of a sort of ink.

The unhealthy tissue of a bunchy top corm is pink or reddish brown. In bananas in the incipient stages of the disease in the lower part of the corm, irregular threads, yellowish red or light brown in colour, are seen. In more advanced stages of the disease these threads are darker and reach the base of the pseudo-stem, and they may run up the stem for a considerable distance.

From these unhealthy corms, cultures of bacteria have been obtained under suitable conditions, which form white, circular, moist, glistening colonies. These colonies must consequently be regarded with suspicion.

Growers are recommended, therefore,

1. Not to plant any bulbs showing the internal symptoms referred to.
2. To dig out and *destroy completely* all bunchy top plants.
3. To keep one set of tools for dealing with bunchy top plants, and to use them for no other purposes.

Colonies of bacteria somewhat similar to those from banana corms have been obtained from the roots of sugarcane showing signs of bunchy top.

The reddish sap that collects in the hollowed out rhizome of a bunchy top plant has been found to have an extraordinarily rapid withering effect upon young shoots placed in it.

The presence of the reddish threads (diseased vascular bundles) is not peculiar to the bunchy top disease; they are found in other banana diseases, including the Panama disease. Dr. Brandes has given a very detailed account of Panama disease in *Phytopathology*, vol. 9, No. 9. Several of the symptoms of this disease are found upon bunchy top plants. The Cavendish banana is not supposed to be susceptible to the disease, which is caused by a fungus, *Fusarium cubense.* A *Fusarium* fungus has occasionally been found upon bunchy top plants.

A bunchy top plant must therefore be regarded as possibly infectious, and the object of the present note is to inform growers of the advisability of destroying bunchy top plants completely (to dig them out and leave them on the ground is of no advantage), and to keep one set of tools for dealing with affected plants and to use them for no other purpose.

That any organism is the actual cause of a disease can only be demonstrated by a series of infection experiments carefully carried out, and these take time, but in the meantime (additional to the foregoing precautions) strict attention to the selection of healthy suckers from healthy stock, and the rejection of those showing internal signs of disease (the red threads can be seen where the sucker has been detached from the parent corm) is recommended as the surest method of eliminating bunchy top.

As still further precautions, the cut end of suckers should be dipped in lime before being planted, and places from which bunchy top plants have been removed should have lime dug into them, and new plants should not be set in such spots for a considerable period.

## Wanted—A Nucleus of Activity in Rural Centres.

Unless country life provides more avenues than are open at present for the employment of leisure time, it is certain that the drift to the towns, which was so noticeable in the past, will continue. In order to prevent this exodus to the towns the great need of the village is, in the Committee's opinion, the improvement of the social life of the countryside. The rural problem is essentially a problem of re-creating the rural community, of developing new social traditions and a new culture. What is needed is to establish in the village a living nucleus of communal activity which will serve as a centre for the satisfaction of the social and intellectual needs of the people. Such a nucleus the Committee conceives to be a village institute, under full public control.—Extract from a report on the problem of adult education, issued by the Ministry of Reconstruction, London.

## The Effect of Coal Smoke on Vegetation.

The main detrimental effects of air pollution by coal smoke upon vegetation may be summarised as follows :—

1. The cloud of smoke blocks out the sunlight, and thus reduces the available solar energy by, in some cases, as much as 40 per cent.

2. The thick deposit on the leaves of plants and trees still further blocks out the light.

3. The choking of the stomata by the tarry glutinous matter tends to asphyxiate the plant, and effectively to check its power of assimilation of carbon dioxide.

4. The presence of free acids in the air tends generally to lower the vitality of the plant.

5. The free acids falling on the soil make it sour, and thus limit the activity of the soil organisms, which must work freely if the soil is to maintain its fertility.—A. G. Ruston, in the *Journal of the Ministry of Agriculture*, London.

# Sweet Corn.

## Variety Trial, 1919-20.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

A trial of different varieties of sweet corn was made last season on the farm of Mr. R. Yates, Ourimbah. The seed was imported from several American seedsmen, and the trial was designed to indicate which varieties succeed best under our conditions, and therefore to serve as a guide to our seedsmen, who mostly import their seed yearly from America, and to those progressive growers who will always insist on having the best varieties.

The district in which the trial was conducted is particularly suited to the growth of sweet corn as a market crop. It is midway between two good city markets—Sydney and Newcastle—and a third good market is sometimes available by arrangement with a canning factory at Dora Creek. The fresh produce can be sent daily by passenger train to each of these markets, and Mr. Yates, who has grown sweet corn for many years, and marketed the produce at Sydney and Newcastle at prices ranging from 5s. to 8s. per bushel of cobs, last season made arrangements with the factory referred to to take the whole of the produce from the experiment plot at 5s. per bushel.

Though good pockets of rich soil exist along the many creek banks in this district, which are used by orchardists for growing cabbages and other vegetables between the trees of young and old orchards, and which should give better results with sweet corn than those presented here, the soil on which the experiment was conducted was the poorer hillside of ordinary sandstone formation. With the aid of fertiliser, it is possible to produce good results with sweet corn on this soil in between young fruit trees in normal seasons, and the results obtained in this trial were highly satisfactory, the season being practically all that could be desired. Mr. Yates stated that the returns from the sweet corn on this hillside were as good as he obtained from cabbage on the better alluvial soil on creek banks.

The trial was sown on 9th October, 1919, and 3 cwt. P7 mixture, which comprises equal parts of superphosphate and bonedust, was applied before sowing in the drills that had been opened out 4 feet apart between young fruit trees. The earliest variety, Golden Bantam, was fit to harvest about the end of the year, and was closely followed by the second early varieties early in January, while the latest varieties, Country Gentleman and the Evergreens were not ready till early in February. Under ordinary conditions, sowing early in October brings the harvesting of sweet corn right into the busy fruit-picking season in this district. It is, therefore, advisable for anyone who contemplates sowing much sweet corn in this district to delay the main planting till early in November, which will bring harvesting time to February when the rush of the fruit picking is over. Sweet corn sowing may be continued up till the end of December or early in January in this district.

Some consideration might be given, also, to the production of a small amount of sweet corn for seed. Sydney seedsmen last season were selling sweet corn seed for 4s. per lb. A little local production of seed of the best varieties should have the effect of reducing this cost.

The following are the results of this trial:—

| Variety. | Yield per Acre. | | Number of Cobs per Acre. | Variety. | Yield per Acre. | | Number of Cobs per Acre. |
|---|---|---|---|---|---|---|---|
| | tons | cwt. | dozen. | | tons. | cwt. | dozen. |
| Mammoth White Cory | 5 | 9 | 850 | Stowell's Evergreen... | 2 | 8 | 378 |
| Zig Zag Evergreen ... | 3 | 18 | 605 | Metropolitan... ... | 2 | 5 | 424 |
| Howling Mob ... ... | 3 | 7 | 624 | Early Evergreen ... | 2 | 2 | 397 |
| Cosmopolitan ... ... | 3 | 4 | 594 | Hiawatha ... ... | 1 | 19 | 367 |
| Country Gentleman ... | 2 | 18 | 450 | Golden Bantam .. | 1 | 16 | 510 |
| Early Crosby ... ... | 2 | 15 | 510 | Henderson ... ... | 1 | 7 | 254 |
| Black Mexican ... | 2 | 11 | 561 | Golden Rod ... ... | 1 | 7 | 303 |

The results are given at per acre—the weights for the information of the grower who is marketing to a cannery, and the number of cobs for the farmer who is sending to a city market for sale as fresh cobs.

Some growers are fortunate enough to send fresh cobs direct to the consumer (usually a big city restaurant or hotel) and escape the middleman's charges. Some of these men have assured the writer that they have a contract for so many fresh cobs weekly at 3d. or 4d. per cob. With the yields of the best varieties as given here such a price returns a very handsome profit indeed. The city fruiterers usually sell sweet corn cobs at 3d. and 4d. per cob during the season, but this means an average of only 1d. per cob to the grower, which is about the usual price when the produce is marketed by weight at 5s. to 8s. per bushel of cobs—about fifty to seventy cobs per bushel being about the average for all varieties.

The varieties tested matured in the following order:—Golden Bantam, Mammoth White Cory, Metropolitan, Golden Rod, Early Crosby, Hiawatha, Cosmopolitan, Howling Mob, Black Mexican, Early Evergreen, Henderson, Zig Zag Evergreen, Stowell's Evergreen, and Country Gentleman.

## Notes on Varieties.

A few notes follow on the varieties included in this test, and on others which have been previously tried in New South Wales by the Department. They are arranged approximately in order of maturity.

*Golden Bantam.*—A very early dwarf variety, never more than 4 or 5 feet high, with cobs 5 to 6 inches in length, carrying usually eight rows of broad grain of rich golden-yellow colour and very sweet flavour. The yellow colour, which shows faintly at the "roasting" stage, is not fancied on the market, as it too closely resembles field corn, for which it is mistaken. For canning, the yellow colour is also undesirable. This variety has its place only as a home garden sort and then only on account of its exceptional earliness. It is easily surpassed in yield and rivalled in quality by others which are only a week or so later.

*Early Fordhook.*—This is an extra early variety, which has small ears with about eight rows of broad white grain. It has yielded very poorly in comparative tests in this State and was also found to be of rather poor flavour.

*Mammoth White Cory.*—This particular variety is not to be confused with White Cob or Red Cob Cory. The Mammoth White Cory is catalogued by only a few seed firms in America, and, although early, it has larger ears than the original Cory varieties. There also appears to be a greater number of rows of grain on the ears of the Mammoth variety, and the flavour is quite as good as any. In this trial at Ourimbah, it excelled all others in yield and produced good sized marketable cobs which were remarkable for their uniformity in size and time of maturity—nearly the whole of the crop being harvested at one picking.

*Metropolitan.*—This is an early variety of good flavour with fair sized ears, but not as productive as Cosmopolitan, with which it is likely to be confused owing to the similarity of name.

*Peep o'Day.*—A very early variety with small ears, and not worth growing on account of its unproductiveness as compared with other varieties of equal earliness in maturity.

*Ruby.*—A variety not yet sufficiently tested in this State under comparative conditions, but from private reports considered to be a very productive early variety with large ears; grain of good quality and of a deep red colour when fully mature, but with a slight tinge of colour when at the eating stage. Probably one of the best varieties for the home garden.

*Golden Rod.*—Supposed to be the result of a cross between Stowell's Evergreen and Golden Bantam; an early very poor yielding variety which has the further objection of yellow grain.

*Kendal's Early Giant.*—A variety not yet tried in New South Wales, but catalogued by several American seedsmen. It is stated to have fairly large ears with about ten or twelve rows of large grain, and to mature a few days earlier than Crosby.

*Early Mammoth.*—A variety with fairly large ears, with broad white grain. It ripens at about the same time as Crosby, but the flavour is only second rate, and it does not yield nearly as well as Late Mammoth.

*Early Crosby.*—This variety has yielded well wherever it has been tried in this State, being the most productive early sort in at least two tests and well up in order of merit in three or four other trials. Although beaten in yield by other varieties in the experiment plot last season at Ourimbah, its evenness in type, size of ears, and time of maturity make it readily commendable to any who try it. It is one of the varieties most largely grown for canning in America. The growth of stalk is usually only about 5½ or 6 feet, and marketable cobs are produced in about twelve weeks from planting. The cobs are about 7 inches in length and carry a fairly large number of rows—twelve to sixteen. The grain is somewhat narrower than most other varieties, but very even and regular on the cob and white in colour. The flavour is not quite up to some of the best, but quite good for sweet corn.

*Hiawatha.*—A medium early white variety, but not a good yielder.

*Cosmopolitan.*—A medium early white variety of excellent quality, bearing fairly large ears. This variety has yielded consistently well in several tests, and has given indications that it will always be one of the best varieties on good soils.

*Howling Mob.*—A variety very similar to Cosmopolitan in type of ear and time of maturity—in fact, it is difficult to say where the distinction lies.

*Potter's Excelsior.*—This variety has not been sufficiently tried out yet here, but gives fair sized ears of good quality.

*Black Mexican.*—A variety with deep bluish purple or black grains when ripe, and showing considerable trace of colour at the eating stage. The growth of stalk is fairly good (about 6 feet), and the ears are fairly long, with a small number of rows (usually eight) of broad grain. It has a good flavour, but on account of its colour it is objectionable for canning. It is distinctly worthy of a place in the home garden, being nearly a week earlier than the late sorts, like Stowell's Evergreen and Country Gentleman.

*Early Evergreen.*—This variety resembles Stowell's Evergreen, but is a week or so earlier. It is not, however, as good a yielder as Stowell's.

*Zig Zag Evergreen.*—A late variety, with large ears and irregular rows of grain; a few days earlier than Stowell's Evergreen, and apparently a good yielder. It is also of good quality.

*White Evergreen.*—One of the best late varieties tried, giving a good growth of stalk and large cobs, which carry a large number of rows of grain of pure white colour. It is a few days earlier than Stowell's Evergreen, and has usually yielded better than that variety in our trials. This variety is catalogued by several of the best American seedsmen.

*Stowell's Evergreen.*—One of the most popular late varieties, and one which has always given fairly good results in all trials. It is the standard variety for home use, for market, and for canning. The stalk growth is tall, the cobs large and well filled with regular rows of broad deep grain of good quality. All the evergreen types have the characteristic of keeping their flavour well for some time after harvesting.

*Late Mammoth.*—A promising late variety, which has not yet been fully tested here. It is a large eared variety, maturing a few days after Stowell's Evergreen. The ears are large and thick, being well filled with broad grain of good quality.

*Country Gentleman.*—A very old and popular late variety—supposed to be either a large type of Ne Plus Ultra, or a cross between that variety and Stowell's Evergreen. The ears are large, with a small core and deep narrow grain irregularly arranged on the cob. It is of excellent quality.

*Papago.*—A very late variety—about a fortnight or so later than Country Gentleman—taking sixteen or seventeen weeks to reach the harvesting stage. The stalk growth is very tall and somewhat thin, and the cobs also are long and thin. The grain is not very deep nor very broad, and the flavour is not quite up to the best of the sweet corn varieties, but still quite good. It is easily the best variety for dry districts, or under irrigation.

The following recommendations as to varieties are made from the results obtained up to the present :—

*For the Home Garden.*—Mammoth White Cory, Ruby, Cosmopolitan, Black Mexican, Stowell's Evergreen, Country Gentleman, Papago.

*For Market or Canning.*—Mammoth White Cory, Early Crosby, Cosmopolitan, White Evergreen, Stowell's Evergreen, Country Gentleman, Papago.

*For further Trial.*—Kendal's Early Giant, Howling Mob, Potter's Excelsior, Late Mammoth.

## Nitrate of Lime.

The process involved in the production of nitrates from the nitrogen of the air consists in passing air through an arc flame (at a temperature of about 3,200 deg. C.) produced between electrodes in a powerful magnetic field. The resulting nitric oxide gas is then cooled by suitable means and passed through so-called oxidation chambers, where it is given time for complete oxidation to nitrogen peroxide. Subsequently, the nitrogen peroxide gas is passed up absorption towers, where it meets a descending stream of water and is converted into nitric acid. For fertilising purposes the nitric acid is then neutralised with limestone, and the product, after solidification and granulation, is sold as a manure under the name of nitrate of lime.

The commercial success of the process is dependent on the availability of cheap electric power, which, in Norway, is ensured by the numerous natural gigantic waterfalls.—G. A. Cowie, M.A., in the *Journal of the Ministry of Agriculture*, London.

## Eradication of Bracken.

Experiments conducted by the University College of North Wales have shown that manuring alone has had no effect in the eradication of bracken, but, when combined with regular cuttings of the plant, a great improvement has been obtained. The most certain method of dealing with the pest, according to a publication of the University College, appears to be regular and careful cutting at monthly intervals, commencing in the first week in June (mid-summer in England), and continuing in the first week of July, August, and September. In this way it has been found that in a few years bracken, even of the strongest growth, will have completely disappeared.

## A Sociological Problem.

It is not necessary to dilate upon the urgent importance of the development of social activities in the country districts. The dullness of village life has long been recognised as one of the main reasons for the migration of the sons of the soil to scenes of fuller activity, but efforts to alleviate it have been spasmodic and sporadic. The time has come when the human needs of the countryside have become insistent, and the future of agriculture is seen to involve a sociological, as well as an economic, problem.—Sir Henry Rew, in the *Journal of the Ministry of Agriculture*, London.

## PURE SEED GROWERS' ORGANISATION.

THE Department of Agriculture has decided to compile for monthly publication, a list of the growers of pure seed of good quality, of wheat, oats, maize, sorghum, Sudan grass, potatoes, and other crops, in order to encourage the efforts of those who have been devoting their attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds. It is hoped that this will be the means of a more widespread use of good seed of the most suitable varieties, more especially of those recommended by the Department for different districts as the result of many years' experience in variety trials.

Farmers who have pure, high-class seed of good quality of any variety of crop, are asked to communicate with the Department stating the variety of seed, the approximate amount, and the price required per bushel. The communication should be made during the growth of the crop, so that arrangements may be made, if possible, for a field inspection to be made by an officer of the Department.

It might be mentioned that there is a keen demand (much in excess of the visible supply) for such varieties of wheat as Thew, Florence, Huguenot, &c., and for such varieties of oats as Sunrise and Ruakura, which are being increasingly grown on the coast for winter green feed; also for potatoes grown on the tablelands for seed in coastal districts, such as Up-to-date, Early Rose, Manhattan, Brownell's Beauty, &c.

The following list includes names of farmers who have been growing pure seed maize in co-operation with the Department for many years:—

| | |
|---|---|
| Silver King | A. Summerlad, Tenterfield. |
| U.S. 133 | P. Gersbach, Farm 330, Leeton. |
| Brewer's Yellow Dent | H. Manser, Sunnyside, Tenterfield. |
| Early Yellow Dent | Manager, Experiment Farm, Glen Innes. |
| Silvermine | Manager, Experiment Farm, Yanco. |
| Small Red Hogan | H. Short, Dorrigo. |
| Gold Standard Leaming | G. Lindsay, Horsley, Dapto. |
| Craig Mitchell | W. D. K. Humphries, Muswellbrook. |
| Goldmine | A. Louttit, Moruya. |
| Boone County White | J. Chittick, Kangaroo Valley. |
| Hickory King | Manager, Experiment Farm, Berry. |
| Golden Beauty | R. Richardson, Mondrook, Tinonee. |
| Leaming | Manager, Experiment Farm, Grafton. |
| Golden Nugget | J. W. Smith, Wauchope. |
| Early Clarence | F. Dowling, Tumut. |
| Giant White<br>Manning White, or<br>Macleay White | A. M. Singleton, Henley, Sydney. |
| Improved Yellow Dent | Manager, Experiment Farm, Grafton. |
| Cocke's Prolific | J. P. Mooney, Tinonee. |
| Golden King, or<br>Hawkesbury Champion | E. Blackburn, Warkton, Coonabarabran. |
| Red Hogan | Principal, Hawkesbury Agricultural College, Richmond. |
| Papago Sweet Corn | R. Yates, Ourimbah. |

In order to ensure the production of pure seed it is desirable that special precautions be taken to prevent varieties of maize, sorghum, and rye (which are wind pollinated) from being crossed with other varieties. This can be done by sowing at a different time or in a plot removed some distance from other varieties sown at the same time, and by no more than two or three varieties of wheat, oats, &c., being offered as pure seed on the one farm, unless special provision is made to ensure their purity.

# Faults found in Butter.

## Their Definitions, Causes, and Some Suggested Remedies for Same.

[Concluded from page 494.]

A. M. BROWN, Dairy Instructor and Grader.

### "Over-neutralised."

THE term "over-neutralised" means that too much neutralising agent has been used to reduce the acidity of the cream before heating in the process of pasteurisation; this renders the butter lacking in the characteristic butter flavour and of quite a tallowy inclination.

When an unusually large amount of soda or lime above the required amount has been used, practically no other flavour can be detected than that of either of these neutralising agents, and the result is anything but pleasing to the palate, especially as regards the lime. The trouble is in most cases due to oversight or carelessness on the part of the person who does the work of neutralising at the factories. Many of these persons do not take the acidity of each batch of cream before adding the soda or lime, but simply guess the quantity required to reduce the acidity to a certain percentage. Day in and day out they use the same quantity of neutralising agent for the same quantity of cream without endeavouring to ascertain whether the percentage of acid in the cream to be pasteurised is the same on each occasion.

In relation to this effect of over-neutralisation of the cream on the quality of butter, one wonders if it has ever occurred to the persons responsible for this trouble to consider what a mistake of, say, ·1 per cent. of acid in a large batch of cream means in the quantity of soda necessary to neutralise same? Let me quote a supposititious case for their perusal.

A factory receives, say, 600 gallons of cream on a Monday, which represents four separations. The acidity is taken and is found to be ·5 per cent. It should, therefore, require 18 lb. of soda to reduce the acidity to the required percentage of ·2. On the same day of the following week a similar quantity of cream is received, but on account of the coolness of the weather on this and the previous day the acidity of this cream is actually only ·4 per cent., and the person who does the work of neutralising does not bother to take the acidity but uses the same amount of soda as on the previous Monday. The actual amount necessary to reduce the acidity to the required percentage of ·2 in the latter instance is only 12 lb., and thus 50 per cent. more than is necessary is used. This example is in no way an extreme one, for with varying temperatures of weather and differing periods of time elapsing between deliveries of cream, the acidity of the bulk will vary very considerably, so that, when one considers the effect of 50 per cent. of extra soda on the quality of the butter, it should convince even the most thoughtless person that careless methods such as these must lead to disastrous results.

In passing, it might be stated that the effect on the quality of butter of over-neutralisation with lime is very much worse than when soda is used, a disagreeable decomposed smell and taste being produced. If the percentage of acid be reversed in the above supposititious case, it will also be noted how under-neutralisation may occur, and the curdling of cream when going through the pasteuriser be produced.

Wrong methods in taking the acidity of the cream also contribute more or less to cause the fault now under review. To remedy this trouble, always have a soda solution of the right strength, and keep the bottle containing it well corked up when not in use, as exposure to the air causes it to lose strength. Secure a representative sample of the batch of cream, take the acidity of every lot of cream before adding the neutralising agent, read the burette when only a very faint lasting pink colour is noticeable in the sample, and be careful to calculate correctly the quantity of soda or lime required. Also, mix the neutralising agent as equally as possible through the volume of cream.

### "Sour."

The term "sour" means that the butter has a sourness other than lactic sourness. This fault is caused by the fermentation of thinly separated cream which forms an acid other than lactic acid. Butter made from such cream has a very strong aroma which at once indicates the fault.

There is another kind of sourness, which is caused by the retention of a large percentage of buttermilk in butter, the result of careless manufacture. To remedy this fault the farmers should be impressed with the necessity of complying with the regulation under the Dairy Industry Act, which requires them to supply cream containing not less than 30 per cent. fat (preferably 35 per cent.) during the winter months, and not less than 35 per cent. (preferably 40 per cent. to 42 per cent.) during the summer months. This should do away with the trouble of thin cream, and the buttermaker should refrain from following methods of manufacture which tend to the retention of an extra amount of buttermilk in the butter, and should avoid high churning temperatures, insufficient washing, churning the grain too large and insufficient working.

### "Cheesiness."

This fault may be caused by contamination of cream on the farm or at the factory through its coming in contact with dirty cans, with utensils which have been wiped with dirty cloths, or with coolers, pipes, &c., which have not been kept clean. It is a condition that is probably due to some bacterial or chemical fermentative action on the casein. The flavour is similar to that of matured cheese.

In one case that came under my notice, butter from a certain factory was found to have a cheesy flavour, and this same flavour was afterwards noticed in the cream while it was running over the cooler directly after leaving the pasteuriser. On search being made as to the cause of this, it was found that an attachment to the top of the cooler had not been properl cleaned for some time, and immediately the cream had passed over it i assumed this flavour. When the butter made from this cream was examined the next day a similar flavour was immediately detected.

### "Cooked."

This means that the butter has assumed a flavour somewhat similar to that of milk which has been heated to too high a temperature and thereby scorched.

This "cooked" flavour is caused by cream absorbing the flavour from scorched casein present inside the machine while the process of pasteurisation is in progress.

The scorching may be brought about in two principal ways, the first of which is the use of excessively high temperatures in pasteurising, an inaccurate thermometer often being the indirect cause.

The second way, which only happens with the flash system and is the more frequent, is by a comparatively small volume of cream coming suddenly in contact with the hot metal surface of the inside of the pasteuriser when the machine is first started. The casein in the cream becomes immediately scorched and adheres to the hot surface in a thin film. The remainder of the cream, as it passes over this adhered portion, absorbs the scorched flavour, which is afterwards reproduced in the butter. It will be seen that neither system of pasteurisation is responsible for this fault, which is solely due in the first instance to an oversight, and in the second, to faulty manipulation. To remedy this fault, take care, firstly, that the thermometer in use is an accurate one; have the instrument tested for accuracy, and, if not correct, either discard it altogether or have the necessary correction in reading made. Secondly, do not turn on the steam until the machine is practically full of cream. The heating will then be done gradually, and the adherance of scorched casein to the inside surface of the pasteuriser will be prevented.

### "Mouldy."

The infection which causes butter to become mouldy may come from the boxes into which it is packed, from the papers with which the boxes are lined, from the walls or ceilings, or from the close surroundings of the factory itself.

Owing to the shortage of timber, much of that used for making butter boxes has not been allowed to become properly seasoned, and many of the boxes used have been quite mouldy and damp. Immediately butter is packed into those boxes, this mouldy timber becomes the most frequent and ready source of infection. The parchment papers, if not stored in a dry, clean room, free from mould growth, may also soon infect the butter with which they come in contact with mould growth.

Then again, if the woodwork of the ceilings and the walls of the factory is allowed to become damp and rotten, it becomes an ideal growing ground for moulds, the spores or seeds of which, being extremely light, are detached and float about in the air, and are distributed throughout the factory. These spores, as soon as conditions of temperature and moisture are favourable for their germination, soon grow and produce moulds, so that

butter exposed to the air in the factory may be infected in this way, as may also the papers and boxes. To guard against this trouble, only thoroughly seasoned boxes, absolutely free from any sign of mould, should be used.

The papers should always be stored in a light, airy, dry room, and, where wet papering of the boxes is carried on, they should be soaked in a strong solution of boracic acid or formalin before being used.

Any rotten timber about the factory should be removed and replaced by sound timber. When any mould growth shows on the walls, under water tank stages or on ceilings, it should be thoroughly scrubbed, and sprayed with a strong formalin solution. If this does not stop the growth, boiling hot lime should be applied frequently.

Stacking large amounts of wood too near the factory is not to be recommended, on account of the probable prevalence of mould growth amongst it, and the danger of the spores of same being blown into the interior of the factory, where they may set up an infection.

Perhaps the safest method of all to overcome this trouble is to paraffin the inside of all boxes used, and, considering the increasing shortage of suitable timber required for box-making, this method seems to be one that will have to be universally adopted in the near future.

### "Woody" and "Oxidized."

Both these flavours are noted principally on the surface of butter, and they need not be discussed at any great length although considerable deterioration in quality has sometimes been caused by their presence, especially as regards the former fault.

Oxidized flavour is mostly associated with stored butter and is very similar to tallowiness. It is probably due to the butter combining with more oxygen from the air.

The use of unseasoned and unsuitable timber in box-making contributes to cause woody flavour in butter.

Boxes made from wood which is green or which has a foreign smell, as some of our timbers have, should not be used by factories for packing butter unless specially treated, for the contents will soon absorb these smells and also cause the part adjacent to the timber to have a very disagreeable flavour, which, as time goes on, will gradually work further into the butter. The use of paraffin in treating the inside of these boxes would help this trouble to be overcome.

This paper deals only with flavours in butter, but it should not be concluded without mentioning texture, which is a most important factor, influencing both the flavour and the keeping quality of butter.

Every care may be taken with the cream on the farm and at the factory in the endeavour to produce a good butter, but all will be rendered of no avail if the importance of texture is lost sight of; the necessity, among other things, of using low temperatures in churning cannot, therefore, be too strongly impressed on the buttermaker, for therein lies one of the chief means of controlling the texture of butter.

## Bordeaux Powders v. Home-made Bordeaux Mixture.

So many enquiries have from time to time been received regarding the efficiency of Bordeaux powders, that it was decided to test one of the brands as against home-made Bordeaux mixture. Further, it has been claimed that these powders are efficient in the dry form as a preventive of downy mildew—a statement contrary to general experience. It was recognised, however, that if these powders were reasonably useful in checking fungoid diseases of the vine, they would be of great benefit to the smaller growers and householders who had not the convenience to make their own Bordeaux mixture. A series of experiments designed to determine the points at issue was therefore carried out during the past season, under the direction of Mr. H. G. White, Superintendent of the Viticultural Nursery at Narara. The following is a condensation of Mr. White's report:—

"Thirty-nine rows of young Muscat Hamburgh vines were selected for the tests, which compared Bordeaux mixture 6–4–40, with a proprietary Bordeaux mixture powder—(1) in a pure dry state; (2) in a dry state, plus 50 per cent. lime; (3) in the proportion of 6 lb. to 50 gallons of water; and (4) in the proportion of $4\frac{3}{4}$ lb. to 50 gallons of water. The trials were commenced on 15th January, and were continued, except for the applications of (1) and (2), until 19th March. Applications of formulæ (1) and (2) were discontinued after thirty-seven days, as it was found that downy mildew was not being checked by the application of the Bordeaux powder in the dry form; indeed, the upper portion of the vines had lost a large proportion of their leaves—sufficient evidence that the pure powder, and the powder with 50 per cent. lime, were not effective.

"Sprays (3) and (4) were practically no different in their effect to Bordeaux 6–4–40, and on the appearance of the vines to date it seems that the smaller quantity of the powder is as effective as the larger.

"As the tests were not made until after the vines had been treated several times with Bordeaux 6-4-40, further tests seem called for, and it has been suggested that these should take place next year, when each formulæ could be applied from the commencement of the season to rows previously untreated in that season.

"The rainfall from the beginning of July, 1919, to the end of March, 1920, was 2,611 points, and for the actual period of the tests it was 8·06 inches."

From the foregoing it will be seen that the main facts have been fairly well established, namely, that in the dry form the powders are of little benefit, but when made up with water and sprayed on to the vines there is no apparent difference between them and the home-made Bordeaux mixture. The question of relative cost should be estimated during another season, when the experiment should extend throughout the season. The experience of vine growers in County Cumberland last season should cause them to pay considerable attention to spraying in the future.—H. E. Laffer.

# Poultry Notes.

AUGUST.

**JAMES HADLINGTON, Poultry Expert.**

POULTRY farmers who have acted upon the advice given in these notes will now have their hatching operations in full swing. So far as is known, the hatching results appear to be normal for the time of the year. Many beginners are, of course, disappointed with the results, which appear to them to be poor, though in reality they may be good. More experienced farmers know what to expect from June and July hatchings, and are content to get 20 per cent. or 25 per cent. less than in August and September. Nevertheless, the chickens hatched during the earlier months are the most valuable, and especially so to the poultry farmer who sells stud stock. If one could confine himself to breeding only layers without regard to breeding stock, he would probably find August the best month, but all the chickens required cannot be reared in so short a period on the ordinary poultry farm (even if they were hatched), and to attempt it generally leads to disaster.

By far the best plan is to spread the hatching over the whole period June to September inclusive. In this way the early birds (a comparatively small portion of the hatching) make the best breeding stock, and the August and September pullets should be good layers. These will most likely miss the partial moult in the autumn, to which the earlier birds are most susceptible. Very often this is the factor which determines the high or comparatively low egg tallies made by hens in their first year of laying. It might be mentioned that this factor is the cause of much misjudgment of the laying capabilities of hens in our laying competitions, nor is it possible for any breeder to select pullets for a competition without taking some risk in this respect. Hence, there are many groups that are adjudged to be a poor laying strain, which, had they missed the partial moult referred to, might have been near the top of the list. It would be well if such circumstances were taken into account before passing judgment on any breeder's stock, either for laying competitions or for purchase as breeding stock. One often hears adverse criticism on this or that breeder's birds, but, considering how easily a group of pullets can be thrown off laying condition during the late autumn and winter, it is small wonder misjudgments are made by the novice.

### The Rearing Season.

Success in rearing chickens is the foundation of success in poultry farming. Failure in this means failure all along the line, yet it is surprising how large a number of poultry-keepers fail properly to grasp the art of rearing chickens successfully.

Successful rearing is not simply dragging up batches of chickens—it is not merely keeping them alive. A good deal more than that is involved, because, unless we can secure adequate growth we are not only spending too large an amount of food to get a certain development, but we are also affecting the laying, for slow growth means late laying. In other words, without early laying the pullets are rarely able to put up good performances. Not only so, but badly grown pullets scarcely ever make profitable layers in their second season. A very great proportion of the poor producers are so because of indifferent rearing, rather than because of the innate bad laying quality of the stock.

I might even emphasise the point by saying that I have never seen a well-grown, well-developed flock of utility pullets that would not pay when properly fed and attended to, irrespective of their breeding for egg production. Failure to secure good rearing for two or three seasons will ruin the best of breeds. Unfortunately, it is one of the insidious things that is adversely affecting the poultry industry at the present time.

### Brooder Trouble.

We have now arrived at the months when brooder troubles are most acute. During the months of June and July, as a general rule, batches are small. Everything then is, or should be, clean from the previous season, and conditions generally have been favourable for the early small batches of chickens. Plenty of infertility will perhaps have been experienced from the eggs set, but the chickens hatched will have been on the whole strong.

In August and September more eggs will be available, and better fertility with higher percentages of chickens should result, but right here is where the chicken-rearer enters the danger zone. On very few farms is the brooding capacity equal to that of the hatching facilities. The result is that improvisation and crowding is resorted to in order to accommodate the chickens that appear so welcome. Larger numbers are put into each compartment, until the brooders become so congested that trouble is inevitable. When this happens, the farmer, instead of recognising what he has done, is prone to attribute his troubles to disease—"white diarrhœa" being the one most frequently blamed, because the chickens show more or less looseness, or perhaps enteritis in an acute form. It does not follow, however, that *Bacterium pullorum* (the causative agent of white diarrhœa) is responsible for the trouble, though it is a deceptive feature that nearly all diarrhœa in baby chickens is white.

However, it matters little what the immediate cause is. It has usually been brought about in the manner described, or through other faults in running the brooder. Giving too little warmth is one of the most fatal, because it results in the chickens packing together to get it; indeed, no matter how large the brooder capacity, this will take place if the temperature is kept too low. What is known as "cold brooding"—that is, brooding without heat—is quite a different thing. This method requires the chickens to be run in very small batches to prevent the same occurrence.

Another bad practice in working heated brooders is to put the lamp out, or otherwise let the heat fall too low during the daytime. In this case a cool change or neglect to re-light or heat the brooder sufficiently early in the afternoon will often result in want of warmth when the chickens go up at night.

### Temperatures for Chickens.

To commence with, in the rearing of chickens, preference is given to brooder units having a floor space of 8 square feet, preferably 4 ft. x 2 ft. The following is laid down as fairly safe practice for the number of chickens to each brooder, and the temperatures required from one to six weeks of age.

| Age of Chickens. | No. of Chickens in Brooder. | Temperature. (Bulb of Thermometer 2 inches from floor). |
|---|---|---|
| First Week ... ... | 100 | 90 degrees Fahrenheit. |
| Second and Third Weeks | 75 | 86 to 82 degrees ,, |
| Fourth and Fifth ,, | 60 | 82 to 76 ,, ,, |
| Sixth Week ... ... | 40 | Wean them off the heat. |

After the sixth week the birds should be transferred to rearing pens, the floor space of which should be 8 ft. x 6 ft., which will accommodate 75 to 100 chickens for the first two weeks in the rearing pens, after which they will need thinning down in much the same way as is done during the six weeks in the brooders.

The number of chicks mentioned in the above table should be regarded as the maximum, and preferably ten chickens less should be carried in each case. The temperatures shown are the minima of safety.

### Feeding.

The feeding of chickens is the subject of a leaflet available on application to the Department, but a note of warning might be sounded here in regard to the advice to feed rolled oats to baby chickens. Two, or at most three days, is quite long enough to feed oats and they should not be used for a longer period except where they form portion of a mixture. Not only is the feeding of rolled oats unnecessarily expensive, but extended feeding upon them is inadvisable.

## Clean Pasture for Calves.

The writer is more than ever convinced that the ancient calf-paddock has been responsible for more ailments in cattle than possibly any other cause. It is essential that it be abolished, and replaced by clean new grass pasture, preferably limed when sown down—no matter what the dietary of the calves may be.—J. L. Bruce, in the *New Zealand Journal of Agriculture.*

# Orchard Notes.

## August.

W. J. ALLEN and S. A. HOGG.

### Spraying.

From observations made in many districts, it is only too apparent that this year growers will be confronted with a considerable amount of San José scale, accompanied, probably, by such diseases as curl leaf of peach and shot-hole fungus of apricot. This being so, it will be necessary to pay constant attention to spraying.

It has been found that the use of lime-sulphur is most effective in checking the pest and diseases mentioned, but care should be taken to see that it is applied at the proper time. Spraying for San José scale should be carried out immediately the pruning has been completed, and it is advisable to give a second application before the buds burst. The same advice applies to peach trees, which are liable to be attacked by curl leaf, and to apricot trees, which may be subject to shot-hole fungus. A third spraying, with Bordeaux mixture for shot-hole fungus may be given after the fruit has set.

Miscible spraying oils have been used for combating San José scale with some success, but under some conditions they have completely failed. This is very hard to account for, but the fact remains that even after a lapse of fourteen days after spraying, the scale was still alive. In cases where it is found that the miscible oil has failed, the trees should be given a spraying with lime-sulphur, which, taking everything into consideration, lime-sulphur has generally proved more effective for this particular pest than has miscible oil.

It has been the custom to use miscible oil for the control of woolly aphis, but care should be taken to ascertain that the sap is moving before the oil is applied, otherwise it has a tendency to cauterise the bark. Concentrated nicotine solution is held in high esteem by many growers. It is a most effective spray and in no way injurious, but it is expensive. An advantage possessed by this spray is that it may be applied during the growing season and may be used in conjunction with other sprays such as lime-sulphur, Bordeaux mixture, or arsenate of lead.

### Citrus Trees.

If miscible oils are used for the purpose of destroying scale on citrus trees, they should not be applied in very cold weather. The branches of the trees should be trimmed so as to allow the penetration of the spray, and also to admit sufficient light to mature and develop the wood.

### Vines.

As a precaution against black spot, oidium, and other diseases, sulphuric acid solution, or combined sulphuric acid and sulphate of iron, may be applied to the vines as a swab before the buds have burst. Only the fruiting wood need be dressed. It is claimed that under some conditions it is an advantage to remove the old bark; on the other hand, it has been found an advantage in dry, hot districts to allow the bark to remain as a protection to the stock from excessive heat. After the middle of this month it will become too late to plant deciduous trees.

### Brown Spot of Mandarin.

Where it is intented to treat Emperor mandarin trees for brown spot, the diseased and dead wood should be cut out as far as possible and burnt. The trees should then be sprayed with Bordeaux mixture (summer strength) as the trees put on their fresh growth in the spring, just prior to blossoming; a second application of Bordeaux mixture should be made as soon as the fruit has set. The necessity for later applications of Bordeaux mixture and their frequency, depend on weather conditions. Two growers who have tried this treatment have expressed themselves satisfied with the control over the disease, and one is making a further planting of Emperor mandarins.

Since the experiments with this disease were concluded at Erina, the Department last year commenced another experiment at Somersby. In this case, the trees were younger and the disease was showing further down in the older wood than was the case in the Erina experiment. It was decided to head the trees well back, cutting well below where the disease was showing on the wood, in the expectation of a new growth clean of disease. This was not the result, however, for the new growth developed the disease badly. The experiment is to be continued in the spring, to ascertain whether the disease can be checked by treatment, but so far as the experiment has gone it appears that if trees are attacked when young, or worked with infected buds, it is a much more difficult proposition to deal with it than when the trees are comparatively old when first infected.

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## An Experiment with Table Grapes on Sultana Stock.

That Cornichon and Ohanez vines do better on their own stock than when grafted on to sultanas was recently proved at Yanco Experiment Farm, where, as the sultanas were not required, it was decided to work the table grapes on to them.

The experiment proved exclusively that the procedure was not an economical one. From the appended comparative yields it will be seen that it would have paid better to have uprooted the sultanas and planted the table grapes on their own stock. The vines were planted 10 feet by 10 feet apart.

On their own stock, 360 Cornichon vines yielded 487 half-cases.

On sultana stock, 423 Cornichon vines yielded 293 half-cases.

On their own stock, 360 Ohanez vines yielded 403 half-cases.

On sultana stock, 423 Ohanez vines yielded 301 half-cases.—W. J. Allen.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*What month do you prefer to begin fallowing land for wheat, and what factors influence you in choosing the month? Do you consider anything is gained by waiting until the spring? When do you give the first surface cultivation of the fallow, and does the date on which you start ploughing the fallow have any influence on the date when you first cultivate the surface?*

*Is there power in any form running to waste on your farm? In some cases a very small outlay would perhaps light the farm with electricity, or even drive a chaffing machine. Have you considered how advantage might be taken of it?*

*What points do you observe, if any, in selecting seed-ears of maize from the barn? Are there any visible or easily identified characters of seed ears which, in your opinion, indicate high yielding capacity?*

*In some localities Wickson plum is an erratic cropper. Where the crops have been good, have you seen anything that suggests that interpollination may be the cause? Have you observed any better results where it is planted close to Burbank?*

*Shiro is generally a fairly heavy cropper, but in odd cases it is disappointing. Have you any reason that may connect cross-pollination or late frosts, or anything else, with these variations?*

*What substitute foods have you tried in the poultry yard, and have you been satisfied with the results, or do you think some alteration could have been made with advantage? Has barley been satisfactory as part of the grain feed?*

## REPORTS AND NOTICES FROM BRANCHES.

***NOTE.**—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.*

### Auburn.

Approval has been given for the establishment of a branch of the Bureau at Auburn, and the first meeting of members was held on 12th June. Mr. J. J. Pratt, secretary, reports that there was a fair attendance, and a discussion took place on how to lay out a cottage garden, following on a paper read by Mr. Geo. Sommerville.

A novelty was introduced by one of the members who illustrated how egg shells could be used to germinate tomato seeds. Many aspects of vegetable gardening were discussed by the members. Several attractive specimen roses, carnations, and other flowers, and a good sample of locally-grown onions were exhibited, the last being sold to supplement the funds of the branch.

## Coraki.

A well-attended meeting of members was held on 11th June, Mr. W. J. Hodge presiding.

It was remarked that the exhibit at Coraki show on 18th and 19th June was a record one, and was a source of pride to the members and district generally. Over twenty new members were enrolled for the ensuing year.

## Cotta Walla.

Fifteen members of the branch attended on 7th June, the business consisting of the reading of competition essays which had been judged by Mr. R. N. Makin, Inspector of Agriculture. The papers were of a high standard, the one judged to be best being that entitled "Conservation of Fodder," which is published hereunder. The writer was the secretary, Mr. T. A. Howard. Other papers read were entitled "Oats," and "Practical Hints on Potato Culture."

### Conservation of Fodder.

Australians are apt to conclude that periodic droughts are peculiar to their continent. With a wider outlook they will realise that no country is free from occasional dry conditions, and as climate controls man to a large extent, man must in his turn learn to control climate, or rather, take precautions to tide him over the lean periods which are inevitable.

The obvious lesson taught by the losses and hardships occasioned by drought is that man has not safeguarded himself against the effects of climate. He must do much more than he has previously done to protect himself, and to minimise the disastrous effects of drought. The rise and fall of his fortunes have always been largely attributable to the inscrutable sway of climate, which has at times depleted and ruined his stock and crops, and has driven him out of once prosperous districts into others which have in a degree escaped the ruinous effects of the drought. A secure and successful agriculture is impossible where this destroying force varies as to periods and intensity. Some assert that we can forearm ourselves to a certain degree by studying weather records and information based upon recorded experience on the theory that droughts occur in cycles ; yet there is a great diversity of opinion regarding the length of a cycle, the four-year cycle and the eleven-year cycle probably finding the strongest support. While these theories sometimes come close to the mark, records prove that droughts come at irregular periods.

Perhaps more reliance can be placed on rainfall records, as it is usually found that when the rainfall for the year exceeds the average rainfall the following year will have a scant rainfall. It almost seems that nature is a balance, and if we receive more than our average one year we will go short the next and *vice versa*.

Farmers commonly safeguard themselves against drought by placing any money they can spare in prosperous seasons in a bank, and building up a sinking fund to be used in the purchase of fodder when their stock are in need of it. This idea has some commendable points, such as (1) the reserve is safe from fire, weather conditions and pests, and (2) it does not diminish but rather increases with the added interest.

When the other side is considered, viz., that the fodder which can be bought in drought time is generally of inferior quality and high priced, and that the money which has been earmarked for this purpose only returns the farmer a small quantity of inferior fodder, the previous advantage is more than counterbalanced by the disadvantage, and one starts looking for better methods than these.

Our hope for making provision for periods of scarcity lies in education and enlightenment upon agricultural economy, coupled with the universal use of the silo. Greater economy must be practised, and waste of feed in good seasons should not be tolerated. The silo has always proved of first importance where good and economic feeding is required, for silage makes the best and cheapest substitute for pasture. It is simple and cheap to make and will keep for long periods, and it can be made by the dairyman, grazier or stock breeder in any district. In the drier western districts the pit silo finds favour, and good results are invariably obtained from forage preserved in this way ; indeed, it is a success in any district if a good hillside site is secured, so that an efficient drainage system can be carried out.

The stack silo is a good idea where maize is to be converted into silage, and it has the advantage that there is no outlay of money for its construction, also that it can be built in any handy situation. Still, this style is by no means perfect, for the making of the stack is very laborious, and the waste is sometimes as high as 30 per cent.

The most expensive, but in the end the best, is the brick or concrete silo, as there is very little waste and it is eminently suited for making silage of such crops as maize, sorghum, millet, lucerne, clovers, sudan grass, meadow grasses, cereals and cowpeas. The initial cost of this type of silo, together with the necessary machinery (a small engine, chaff-cutter and elevator), is a big consideration in these times of high-priced materials, but the durability of the structure, the better preservation of the fodder, the amount of labour saved in filling and emptying the overground silo, show that this type is the most satisfactory and cheapest in the long run. In fact, it will prove the best sinking fund of all.

Maize is the ideal silage crop because of its high feeding value and its cheap production, for large yields can be grown on small areas in nearly every dairying district. It should be reaped when in the cobbing stage, and chaffed and filled into the silo as quickly as possible afterwards.

A secondary method of conserving fodder is by cured hay. Lucerne comes first in this class, because of its high nutritive value, and mice and rats do little damage to it if kept from year to year. The cultivation of lucerne is at present confined to a few localities, chiefly river flats, but by experimenting and careful farming this valuable fodder plant may be profitably grown in most districts. Farmers should note that the cost of growing lucerne is ridiculously low after you have a plot on a fair footing.

Wheaten and oaten hay both make good provision against drought, being nutritive and easily fed to stock. The depredations of mice and rats are very appreciable with this class, and consequently it cannot be so profitably kept for long periods like the abovementioned fodders.

In summing up, let us remember (1) that conservation of fodder is the only solution of the drought problem, for there are periods, sometimes of many months' duration, when the soil does not contain sufficient moisture to germinate seeds that may be sown for green fodder for starving stock ; (2) that silage (which contains the sap and juice of the plants) is cheaper and more nutritious than cured hay, giving better results in drought time when there is not a green picking available ; (3) that it is greatly to the farmer's advantage to keep all stock alive in drought time, if possible, as enhanced prices will rule when the outlook becomes promising again—not only to make up losses in other districts but to adjust the shortage which is apparent all over the world.

Departmental Note.—Commenting on the winning essay, Mr. Makin mentioned that the too rapid filling of the silo imprisoned oxygen which generated too great a temperature, with the result that the silage became black ; the filling required care. Although maize was one of the best plants to grow for silage, it did not make ideal silage, as its protein content was low. To make up the deficiency a legume comparatively rich in protein should be added, such as lucerne, cowpeas, velvet beans or clover.

### Cunningar.

The annual meeting of this branch was held on 2nd July. Four new members were elected ; the membership roll now covers thirty financial members. The election of office-bearers resulted in Mr. Thomas Hobson being elected Chairman, and Mr. B. J. Stocks, Hon. Secretary.

It was decided to arrange an exhibit for the Murrumburrah show, a few of the special lines to be included being wheat, wool, mutton, beef, fat lambs, hay chaff, pigs, poultry, fruits, honey, &c. It was also decided that the members take a trip to Temora Experiment Farm late in the spring, and that a picnic and sports meeting be held in the near future.

### Dural.

At the meeting held on 25th June, a discussion took place on several of the subjects suggested in the *Gazette* for the months of May and June.

In regard to the planting of deciduous trees, it is the custom in the district to prepare the soil in June and to plant in July. As regards lime in the orchard, April was considered the best month, and the lime required was stated to be 15 cwt. per acre. Ten new members were elected, and the branch is in a progressive state.

Mr. H. E. Wickham has resigned his position of secretary owing to his departure from the district, and his duties will be carried out by Mr. B. F. Renaut.

### Holbrook.

A pruning demonstration was held at the orchard of Mr. J. Rule on 6th July. Mr. H. A. Mills, Fruit Inspector, was the demonstrator. There was a fair attendance, chiefly of persons interested in fruit-growing, Mr. Jas. S. Stewart, secretary, presiding.

Mr. Stewart, in introducing Mr. Mills, enlarged on the advantages of the Bureau, pointing out that the Department of Agriculture was most anxious that the benefits of its officers' knowledge should be brought right to the doors of those desirous of acquiring up-to-date methods. It behoved farmers to take a keener interest in the Bureau.

Mr. Mills then pruned several apple, pear, plum, apricot, and peach trees, and wound up with the pruning of grape vines. Questions were asked and satisfactorily answered, chiefly with respect to the different kinds of pruning and the necessary solutions and their preparation for all pests of the orchard.

### Kellyville.

At the May meeting a demonstration in veterinary science was given by Mr. F. Whitehouse, B.V.Sc., of the Stock Branch. Mr. Whitehouse gave an interesting and educational demonstration on a horse lent by one of the members. He dealt with the different ailments, and also gave advice as to points to be observed when buying a horse.

### Lidcombe.

A meeting was held on 14th June, there being an attendance of thirty-two members. A lecture was given by Mr. A. Brooks, Works Overseer of the Department of Agriculture, on house drainage. Mr. Brooks' remarks related to the discharge of house sewage in districts where no system such as exists in the metropolitan area is in existence. He recommended that glazed E.W. drainage pipes be laid from such points as the bath, basin, sink, and wash tubs to a small pit or tank, suitably situated in the vegetable garden, and from this, as an overflow, a line with branches of agricultural porous pipes should be laid so that the affluence from the tank could be taken up by the cultivated soil in the garden.

The action and operation of the septic tank was fully explained, but it was pointed out that any such system as that outlined must not have storm or rain water enter it, otherwise it would be a failure. Blackboard illustrations were used in connection with the laying of the drain pipes and the construction of overground channels, for use in positions where the pipes could not be used owing to the contour of the land. The disposal of sewage had been a contentious matter for generations, and in connection with the sewage of the city some of the known effectual systems of rendering it innocuous might have to be resorted to in the near future.

### March.

Mr. Meier, Orchardist at Bathurst Experiment Farm, gave a pruning demonstration at the orchard of Mr. Thomas Boulton on 17th June. The demonstration was well attended and is reported to have been interesting and instructive.

### Milbrulong.

At the request of the branch, Mr. M. Henry, M.R.C.V.S., gave a lecture on eye disease in sheep. Sheep were examined on a local farm by Mr. Henry, and he detailed the symptoms of disease and the method of treating them.

It was pointed out that the eye became shadowed with a white covering, and, as the disease continued, the eyeball protruded beyond its normal condition, and in some cases more serious symptoms were manifested, the sheep becoming totally blind in the affected eye.

Affected sheep should be separated from the main flock, so that they may be hand-fed and thereby prevented from starving, which is very likely to happen under droughty conditions. Then wash the eye with warm water and 4 per cent. boracic acid daily, or put in the eye a few drops of zinc sulphate, 10 grains to 1 ounce of water. In most instances the disease cleared up, but in a few cases the animal remained permanently blind. It was emphasised that, in the treatment of the eye, the same remedy would not suit all or nearly all cases, and correct veterinary diagnosis was desirable before treatment.

Mr. Henry was then asked to deal with other subjects, including remedies for complaints in horses, such as colic, worms, and "greasy heel." Speaking of colic, he pointed out that so many quite different conditions caused the complaint that it was impossible to give satisfactory general advice, and each case must be diagnosed separately. Here again the services of a veterinarian should be availed of. Questions were also answered regarding the maintenance rations for horses, cattle, and sheep.

At a further meeting on 3rd June, orders for farm requirements were placed with the secretary. These orders were valued at £500, and included large supplies of groceries and jams. It is proposed, if the present season continues favourable, to open a co-operative store to be run by local farmers.

A pruning demonstration was conducted by Mr. S. A. Hogg, Assistant Fruit Expert, on 22nd June, at Mr. E. Hoffman's orchard, before a large attendance of members. Instructive information was also supplied regarding fungus and insect pests and spraying methods and materials.

### Miranda.

Mr. R. N. Makin, Inspector of Agriculture, reports that he gave a lecture on vegetable growing to a well attended and appreciative meeting of members on 21st June.

### Penrose-Kareela.

Mr. S. A. Hogg, Assistant Fruit Inspector, gave a pruning demonstration to a fair number of fruit-growers at Penrose on 2nd June.

The usual monthly meeting of the branch was held on 14th June.

### Stratford.

A meeting was held on 26th June, there being a fair attendance of members. General business was transacted, and a short address was given by Mr. Callaghan, of Craven, on farm tractors. The information was based on the use of farm tractors in America and was greatly appreciated.

### Wellington.

The annual meeting of the Wellington branch was held on 15th June, when the report referred to the lectures and demonstrations given by Departmental officers during the year, and also to the papers read by members. The branch had a roll of over forty paid-up members, and it was considered there was every prospect of this number being added to. After discussion it was decided to appoint a sub-committee to go into the matter of the formation of an horticultural society to be run in conjunction with the branch.

The balance sheet showed a satisfactory credit balance on the year's work.

At the conclusion of the business, an interesting paper on carnations was read by Mr. A. V. Brown. It dealt with the preparation of the land, the method of planting, best plants to purchase, and diseases, &c., and the information given was greatly appreciated.

### Wentworthville.

At a meeting held on 23rd June, a paper on stocks and how to grow them was read by Mr. H. F. Emert, and was much appreciated by an audience of about fifty, which included members and their friends.

The membership roll for this branch now numbers forty-two, and there is every indication of this number being added to considerably.

### Windsor.

The second annual meeting of this branch was held on 5th June. The report showed that the membership had increased, despite the fact that meetings of any kind were prohibited during the prevalence of pneumonic influenza. There was no doubt that it was necessary to increase production with a view to helping to relieve the distress following upon the war. One of the most important topical matters was co-operation in purchasing heavy and bulky products needed on the farm and orchard, and such operations should be extended, particularly as regards manures, lime, timber, machinery, &c.

Lectures and demonstrations had been given during the year by several Departmental experts, all being well attended. Few districts had the advantages which Windsor possessed; there was a large population engaged in primary industries, without any large holdings of superior land held for grazing purposes only. Only enthusiasm on the part of everybody concerned was needed to prove the advantages to be derived from the Bureau.

The financial position was highly satisfactory, the credit balance to be carried forward to the next year being £12 17s. 5d.

Mr. R. B. Walker, M.L.A., complimented the members on the useful work which had been done during the year, and commended the Agricultural Bureau. He regarded it, he said, as an essential institution in every farming community, bringing together the primary producers for exchange of ideas on the many complex problems of the soil. Such an organisation could get many concessions for the man on the land that one man single-handed could not obtain.

### Woonona.

At the meeting held on 21st June, Mr. H. G. Smith, Apiarist of Hawkesbury Agricultural College, gave a lantern lecture on apiculture. The lantern slides used gave excellent illustrations, and the lecture was much appreciated. At the close of the lecture a number of questions were asked, and items of special interest to bee-keepers were discussed at some length. The lantern was manipulated by Mr. W. Faulks, one of the members of the branch.

### Yarrunga-Avoca.

At a meeting on 19th May, Mr. F. Whitehouse delivered a lecture on common diseases of dairy cattle, interesting as well as instructing all present.

Mr. WHITEHOUSE deprecated the method of injecting into the udder in cases of mammitis, advocating instead frequent stripping and massage with a liniment composed of 2 parts arnica, 1 part tincture of iodine and 3 parts soap liniment.

The eye trouble so prevalent in stock at present could be recognised and treated in cows in three stages, viz. :—

(1) The weeping condition ; syringe with a solution of boracic acid.
(2) Opacity (so-called "film") ; syringe with solution of zinc sulphate.
(3) Ulceration ; touch with solution of silver nitrate.

In the case of sheep, a solution consisting of 1 oz. tincture of iodine, 12 grains iodide of potassium and 10 oz. water, was recommended, to be injected into the eye once a week.

Questions were asked by members as to the treatment of bloat in cows, it being stated that clover had been responsible for the trouble. The treatment advised was to give 1 pint of raw linseed oil, followed by baking soda and 2 oz. sweet spirits of nitre. The use of the puncture method was deprecated, except as a last recourse.

In the case of cows not getting in calf, syringing with a solution of 1 part tincture of iodine, 12 grains iodide of potassium and 20 parts water was recommended ; the syringing should take place prior to service of the bull.

Red scour in calves was mentioned, and Mr. Whitehouse explained that it was often caused by the failure of the fourth stomach to properly digest the milk, the undigested milk then causing irritation, and leading to the passage of blood. The treatment recommended was to give a dose of castor oil, reduce the amount of milk, give flour gruel, and an antiseptic (preferably formalin) in the milk.

Numerous other questions were valuably answered.

At the meeting held on 26th May, a lecture was given by Mr. R. N. Makin, Inspector of Agriculture, on vegetable growing.

Dealing with the vegetables most suitable to the district, Mr. Makin mentioned that the onion was one of the most profitable crops to grow, provided the soil was free from the eelworm, which was a great pest in some onion-growing districts, and for which there seemed to be no preventive. The onions should be planted in a well-prepared bed, lightly covered and well rolled, so as to make the ground firm and compact.

The cabbage was also referred to, and it was recommended that growers should have their own seed plot, which, in addition to being a saving, would always ensure that the seed used could be relied upon.

As regards potatoes, Mr. Makin recommended planting about 6 inches deep, and the use of blood and bone with superphosphates. This mixture was said to be valuable for nearly all vegetable crops. A number of questions were asked and satisfactorily answered.

## Beekeepers' Prospects for 1920–21.

The prospects for the beekeeper, as far as the flora is concerned, are generally good for this season. It appears that given anything like seasonable conditions, the inland apiarists in most localities will be enabled to make up at least some of the losses caused by the abnormal drought conditions experienced in the past few months. It seems to me that where the severe conditions have affected the colonies, it will ensure future improvement in the stamina of the bees if the queen selected for breeding in the building up work is selected for the qualities of her progeny in resisting the dry conditions. There is a good deal in breeding and selecting to obtain bees that will come through adverse conditions. In practically every case noticed, the Italian bees or good first-cross strains have more than held their own against hybrid and black bees in the test for stamina during the recent drought.—W. A. Goodacre, Senior Apiary Inspector.

# AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Corowa P., A., and H. Society... | J. D. Fraser | Aug. 17, 18 |
| Parkes P., A., and H. Association | G. W. Seaborn | ,, 17, 18 |
| Forbes P., A., and H. Association | E. A. Austen | ,, 24, 25 |
| Murrumbidgee P. and A. Association (Wagga) | A. F. D. White | ,, 24, 25, 26 |
| Lockhart A. and P. Society | E. D. Arnold | ,, 31, and Sept. 1 |
| Albury and Border P., A., and H. Society | A. G. Young | Sept. 7, 8, 9 |
| Young P. and A. Association | T. A. Tester | ,, 7, 8, 9 |
| Cowra P., A., and H. Association | E. P. Todhunter | ,, 14, 15 |
| Ganmain A. and P. Association | T. S. Henderson | ,, 14, 15 |
| Cootamundra A., P., H., and I. Association | N. Gardner | ,, 15, 16 |
| Northern A. Society (Singleton) | J. T. McMahon | ,, 15, 16, 17 |
| Holbrook P., A., and H. Society | J. S. Stewart | ,, 21, 22 |
| Narrandera P. and A. Association | W. H. Canton | ,, 21, 22 |
| West Wyalong and District P., A., H., and I. Assoc. | T. A. Smith | ,, 21, 22 |
| Temora P., A., H., and I. Association | A. D. Ness | ,, 21, 22, 23 |
| Burrowa P., A., and H. Association | W. Burns | ,, 23, 24 |
| Junee P., A., and I. Association | T. C. Humphreys | ,, 28, 29 |
| Murrumburrah P., A., and I. Association | W. Worner | ,, 28, 29 |
| Narrabri P., A., and H. Association | D. J. Bridge | ,, 28, 29, 30 |
| Deniliquin P. and A. Society | P. Fagan | ,, 29 |
| Lismore A. and I. Society | H. Pritchard | Nov. 10, 11 |

## 1921.

| | | |
|---|---|---|
| Kiama A. Society | G. A. Somerville | Jan. 25, 26 |
| Wollongong A., H., and I. Association | W. J. Cochrane | Feb. 3, 4, 5 |
| Cobargo A., P., and H. Society | T. Kennelly | ,, 9, 10 |
| Ulladulla A. and H. Association (Milton) | R. F. Cork | ,, 16, 17 |
| Guyra P., A., and H. Association | P. N. Stevenson | ,, 16, 17, 18 |
| Dapto A. and H. Society | F. James | ,, 18, 19 |
| Yanco Irrigation Area Agricultural Society | R. Tribe | ,, 22, 23 |
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VOL. X XI.     PART 9.     SEPTEMBER 2, 1920.

*Agricultural Gazette of New South Wales.*

# Farmers' Experiment Plots.

## LUCERNE TOP-DRESSING TRIALS, 1919–20.

## Murrumbidgee Irrigation Areas.

A. N. SHEPHERD, Assistant Inspector of Agriculture.

THE undermentioned farmers co-operated with the Department in the above trials during the past season :—

J. Hetherington, Farm 338, Leeton.
H. D. McKellar, Farm 327, Leeton.

The season was most trying, absence of rain and prevalence of dust and wind marking it throughout the year. Very satisfactory results were obtained on both areas, clearly demonstrating the profit to be derived from top-dressing the lucerne paddock.

The rainfall registrations were as under :—

| 1919. | Points. | 1920. | Points. |
|---|---|---|---|
| May ... | 139 | January ... | 50 |
| June ... | 30 | February ... | Nil. |
| July ... | 35 | March ... | 52 |
| August ... | 53 | April ... | 47 |
| September ... | 67 | May ... | Nil. |
| October ... | 90 | | |
| November ... | 39 | | |
| December ... | 147 | | |

*Farm* 338.—The lucerne here was sown in 1914. The soil is a red sandy loam, and may be said to be of the better class land of the area. It was top-dressed with ½ cwt. of superphosphate in the autumn of 1918. In the autumn of 1919 the different kinds of fertiliser were applied through a wheat drill, with tubes loosely adjusted so as to have a broadcasting effect.

The fertilisers used were superphosphate, basic superphosphate, and P7 mixture (equal parts of superphosphate and bonedust), each applied at the rate of 2 cwt. per acre. After the application of the fertiliser the land was cultivated with a narrow tine rigid-tooth cultivator, to work the manure into the soil. Unmanured plots, similarly treated as to manner of cultivation, were used as checks.

On inspection in August it was noted that the growth on the manured plots —especially on that treated with basic superphosphate—was much stronger. This was more fully evident on the second inspection in October, the plot treated with basic superphosphate showing more height and leaf, although the stalk may also have been a little coarser.

A

For the first cutting the crop was irrigated in August and October; for subsequent crops only one watering was given. In all, seven cuts were obtained, extending over a period of seven months.

Basic superphosphate gave an extra yield of 2 tons 11 cwt. per acre, and superphosphate an increase of 1 ton 14 cwt. 1 qr. P7 gave an increase of only 3 cwt. Following were the costs of these fertilisers :—

| | s. | d. |
|---|---|---|
| 2 cwt. basic superphosphate at 8s. 3d. per cwt. cost ... | 16 | 6 |
| 2 cwt. superphosphate at 6s. 3d. per cwt. cost ... ... | 12 | 6 |
| 2 cwt. P7 at 9s. 3d. per cwt. cost ... ... ... ... | 18 | 6 |

The increases in yield and resultant profits after deduction of the cost of the fertiliser were as follows :—

| Fertiliser. | Increase in Yield. | Value of Increase. | Profit. |
|---|---|---|---|
| | tons cwt. | £ s. d. | £ s. d. |
| Basic superphosphate ... | 2 14 | 30 12 0 | 29 13 6 |
| Superphosphate ... ... | 1 14 | 20 8 0 | 19 15 6 |
| P7 ... ... ... ... | 0 3 | 1 16 0 | 0 17 6 |

In estimating the profit, hay was valued at £12 per ton. This is considered a fair average for the past season; in the early part of the season the value was approximately £1), while during the last month settlers received as high as £19 per ton. Seven cuts were obtained over a period of eight months; the first was obtained on 15th October, 1919, and the last on 3rd May, 1920. Yields were as follow :—

| Fertiliser per acre. | 1st cut. | 2nd cut. | 3rd cut. | 4th cut. | 5th cut. | 6th cut. | 7th cut. | Total. |
|---|---|---|---|---|---|---|---|---|
| | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | t. c. q. lb. | c. q. lb. | t. c. q. lb. |
| Basic superphosphate ... ... | 1 11 0 8 | 2 0 2 24 | 1 4 1 0 | 1 7 1 20 | 1 6 3 0 | 1 1 0 4 | 15 0 0 | 9 6 1 0 |
| Superphosphate ... | 1 9 0 16 | 1 17 0 16 | 1 0 3 4 | 1 7 2 16 | 1 8 0 4 | 0 16 3 16 | 9 3 4 | 8 9 1 20 |
| P7 ... ... ... | 1 8 0 0 | 1 10 0 0 | 0 16 2 16 | 1 1 3 20 | 0 19 2 16 | 0 12 2 24 | 9 0 24 | 6 18 0 16 |
| No manure ... | 1 2 3 12 | 1 7 0 16 | 0 15 1 12 | 1 4 0 6 | 0 19 2 16 | 0 15 1 12 | 10 2 24 | 6 15 0 14 |

*Farm* 327.—On this farm plots of lucerne growing on a sandy loam were top-dressed with superphosphate at the rate of 1 and 2 cwt. per acre respectively during May, 1919, methods similar to those applied to Farm 338 being adopted. On inspection in September, the manured plots showed increased growth over the unmanured, in places the lucerne being quite 6 inches taller. This extra growth was noticeable right throughout the season. Owing to the heavy winds, which prevailed during the curing of the hay after the second and third cuts, blowing the cocks about and mixing those of the different plots, only three cuts which were comparable by weighing were obtained. Showery weather interfered with the making of the last cut into

Lucerne top-dressed with Superphosphate at Mr. J. Hetherington's farm, Leeton: Cutting the third growth of the Season.

The effects of top-dressing at Leeton. A heavy crop in cocks.

On the way to Market.

hay, and the weight of this cut was not taken, but from the appearance of all three cuts the plot manured with 2 cwt. superphosphate would have given the heaviest yields.

As in the other plots the crop was watered once during each growing period. Although this may have been sufficient for this particular land, on a heavier class of soil the crop would have required water much oftener. Yields were as follow :—

| Fertiliser per acre. | 1st cut. | 4th cut. | 5th cut. | Total. |
|---|---|---|---|---|
| | t. c. q. lb. | t. c. q. lb. | c. q. lb. | t. c. q. lb. |
| 2 cwt. superphosphate ... ... | 1 6 1 0 | 1 3 3 0 | 19 1 8 | 3 9 1 8 |
| 1 cwt. superphosphate ... ... | 1 2 1 16 | 1 1 1 0 | 19 2 12 | 3 3 1 0 |
| No manure ... ... ... | 0 15 1 20 | 0 16 1 0 | 14 1 17 | 2 6 0 9 |

From the results obtained it is very evident that the top-dressing of lucerne is a payable proposition—more especially in such a season as that just ended.

## Central Coast.

J. M. PITT, Assistant Inspector of Agriculture.

The following farmers co-operated with the Department in conducting trials with top-dressing of lucerne during the season 1919–20 :—

R. Richardson, Mondrook, Manning River.

V. Murray, "Pigeon Grove," Pampoolah, Lower Manning.

A. Smith & Atkins Bros., Bandon Grove, Dungog.

August, September, and a part of October were dry months, but there was a good rainfall, though patchy, during November. From December onward the rainfall was heavy, and more even in character, over the greater portion of the coast. The Pampoolah plots were unfortunate in missing the earlier showers. A dry spell during the third growth at Mondrook considerably reduced the yields, although the top-dressed sections still maintained their increased growth.

### Mondrook.

Soil, deep alluvial ; lucerne established about four years ; stand fairly good and even ; field used for hay and green fodder, the latter usually being mown in sections and carted off. The object of the top-dressing was to obtain increased growth.

Fertiliser applied by hand on 17th August, 1919, after the winter growth had been removed and field given a cultivation ; harrowed after top-dressing.

WEIGHT of Green Fodder per acre.

| Top-dressing on 17th August, 1919. | 1st Cutting, 20th October, 1919. | | | | 2nd Cutting, 24th November, 1919. | | | | 3rd Cutting, 1st January, 1920. | | | | 4th Cutting,* 17th February, 1920. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| 2 cwt. superphosphate ... | 5 | 19 | 2 | 8 | 6 | 2 | 0 | 14 | 3 | 2 | 0 | 25 | 5 | 11 | 0 | 5 |
| 1 ,, ,, ... | 5 | 2 | 2 | 4 | 4 | 18 | 0 | 24 | 2 | 3 | 3 | 12 | 4 | 6 | 1 | 20 |
| No manure ... ... | 3 | 7 | 2 | 0 | 3 | 7 | 2 | 0 | 1 | 11 | 1 | 20 | 4 | 1 | 0 | 20 |
| Rainfall for each cutting from 1st August | 106 points. | | | | 132 points. | | | | 219 points. | | | | 1,259 points | | | |

* A further growth was used for cow fodder and not weighed.

| Fertiliser. | Total Yields. | | | | Increase due to Fertiliser. | | | | Approximate Monetary Return.* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | £ | s. | d. |
| 2 cwt. superphosphate ... | 20 | 14 | 3 | 24 | 8 | 7 | 1 | 12 | 5 | 15 | 0 |
| 1 ,, ,, ... | 16 | 11 | 0 | 4 | 4 | 3 | 1 | 20 | 2 | 18 | 0 |
| No manure ... ... ... | 12 | 7 | 2 | 12 | ...... | | | | ......... | | |

* Green fodder valued at 15s. per ton; superphosphate at 5s. 3d. per cwt.

With an application of 2 cwt., this farmer had thus at his disposal an increase of over 8 tons of green fodder per acre, which would be equal to 2¾ tons of hay; at recent high prices for hay this would represent approximately a profit of £44. In the case of the 1 cwt. of superphosphate, the increase of green fodder was over 4 tons per acre, and in hay this would mean nearly 1½ tons, approximately a profit of £21.

Observations made during growth also showed that the stand had been considerably strengthened, and the plants maintained a dark green growth throughout.

### Pampoolah.

Soil, rich, deep, heavy loam; stand established five years ago, becoming thin through grazing; occasionally cut for hay; early spring growth grazed; field cultivated and fertiliser applied 24th October, 1919, and harrowed in. The object of top-dressing was to thicken the stand and increase the growth.

WEIGHT of Green Fodder per acre.

| Fertiliser. | Yield, 19th February, 1920. | | | | Increase due to Fertiliser | | | |
|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. |
| 2 cwt. superphosphate ... | 5 | 1 | 0 | 8 | 1 | 7 | 1 | 8 |
| 1 ,, ,, ... | 4 | 0 | 0 | 0 | 0 | 6 | 1 | 8 |
| No manure ... ... ... | 3 | 13 | 2 | 20 | ......... | | | |

Probably owing to its geographical situation, Pampoolah was not favoured with the same rainfall as the sections nearer the hills consequently it was

found impossible to obtain the weights of more than one growth. Owing to the dry conditions and scarcity of cattle feed, the other growths were grazed. The top-dressed sections were conspicuous with their increased and richer-coloured growth.

### Bandon Grove.

Soil, deep rich light loam; stand established about four years, and still good; field used for hay and green fodder; after removal of winter growth, field harrowed and cultivated; top-dressing applied in mid-August. The object of the experiment was to obtain increased yields.

WEIGHT of Green Fodder per acre.

| Fertiliser. | 1st Cutting. | 2nd Cutting, 18th December, 1919. | 3rd Cutting, 27th January, 1920. | 4th Cutting, 24th February, 1920. | 5th Cutting. |
|---|---|---|---|---|---|
| | | t. c. q. lb. | . c. q. lb. | t. c. q. lb. | |
| 2 cwt. superphosphate. | Not weighed. | 5 0 1 12 | 5 7 3 12 | 4 16 3 4 | Not weighed. |
| No manure ... | ,, | 5 8 0 2 | 4 4 2 16 | 4 2 3 4 | ,, |

The increase due to the top-dressing was 1 ton 9 cwt. 1 qr. 12 lb.

The first growth was not weighed owing to the field having been unevenly cut previously; this also influenced the second growth. It was particularly noticeable on these plots that the treated sections matured earlier than the untreated. The third cutting benefited by the most consistent rainfall, and the top-dressed plot in consequence showed the greatest increase for this period.

### Some Comments on Top-dressing.

In addition to the results detailed above, the following points may also be worthy of consideration by farmers who contemplate carrying out this valuable treatment of their lucerne stands.

1. *The Successful Trials Conducted at Glen Innes.*—In these comparatively poor, heavy black soils—barely 6 inches deep and overlying a stiff, retentive subsoil—the following increases in yield were obtained in the seasons 1916-17-18 from applications of fertiliser:—

| | |
|---|---|
| 1 cwt. superphosphate ... ... ... | 3 tons 19 cwt. |
| 2 ,, ,, ... ... ... | 7 ,, 12 ,, |

These results were obtained with a growing period of 244 days and a 30-inch rainfall, and represented a monetary profit of £2 14s. in one case and £5 4s. in the other, estimating green fodder at 15s. per ton and superphosphate at 5s. 3d. per cwt. It seems only reasonable to believe that on soils more suitable for lucerne culture, and in districts with a greater and more certain rainfall, the results would be quite as satisfactory.

2. *Profitable Lengthening of the Life of Certain Fields.*—Many stands of lucerne are hardly profitable enough to maintain after a certain number of ears though quite good enough to be persevered with for a small monetary

outlay while other fields are being established. This is especially the case where lucerne fields are periodically used for grazing cattle, the stands becoming thinned by injudicious grazing and neglect. Applications of superphosphate in cases such as these have given highly satisfactory results, by considerably strengthening the stand and encouraging a much more vigorous growth. The top-dressing of fields badly infested with couch grass, paspalum, or nut grass is not recommended, as superphosphate acts as a stimulant to them as well as to the lucerne. The best remedy in such cases is the plough.

3. *The Certainty of Greatly Increasing the Output.*—In days gone by it was almost a common occurrence to hear of lucerne fields ranging up to 20 years of age. These were sown mostly on the rich, deep virgin soils bordering the northern coastal rivers. Of recent years, however, it is only on rare occasions that one comes across a field profitable at half that age, the majority averaging between four and seven years. No doubt the advent of the cow, enabling money to be earned more easily, has been responsible for a certain amount of laxity in the growing of crops such as lucerne. Through the humus content being gradually depleted by the continuous growing of such crops as maize and sorghum, and the adoption of other unsound cultural methods, the soil has naturally decreased in fertility. These, in conjunction with the sowing of inferior seed and the careless handling of established lucerne fields, are some of the primary causes of latter-day failures. Further, there is a mistaken idea, prevalent among growers, that a lucerne field requires no further attention than perhaps the usual cultivation given early in the spring, and that it naturally increases in fertility. Being a legume, these farmers argue, the lucerne can gather nitrogen from the air and enrich the soil; moreover, say they, its wonderful root system can traverse a wide area in the soil in search of other necessary plant foods. All these things are undoubtedly true; but to be profitable, and to be continuously so, lucerne requires attention as much as any other crop, and the farmer who would lengthen the life of his stand and also derive from it the maximum return while it is with him, will take care of it and neglect nothing that will invigorate and maintain it.

That the plant responds to the application of superphosphate has been demonstrated in various trials. Top-dressing at the rate of 2 cwt. per acre early in the spring has proved most advantageous. A mixture of 1 cwt. superphosphate and ½ cwt. sulphate of potash has also given very promising results.

Top-dressing experiments have barely passed the initial stages, and there is every probability that when further trials (based on the analysis of the soil, the plant's requirements, climatic and other conditions) have been made, a fertiliser will be revealed that will not only give greater and more lasting yields, but with periodical applications will considerably lengthen the life of the stand.

### Advantages of Top-dressing.

1. Quick response, fields becoming green long before untreated sections show any change.
2. Thickening of the stand.
3. Reduced coarseness in the stem.
4. Growth more succulent, richer and darker green in colour.
5. Growth matures earlier.
6. Growth maintained throughout the season with one application.
7. Greatly increased yields.
8. Freedom from insect and fungus pests.
9. Less apparent weed growth.
10. Greatly increased growth during periods of heaviest rainfall, showing its value under irrigation.

### Disadvantage.

Top-dressed paddocks are less resistant to dry spells than untreated plots, probably owing to the increase in surface root system.

## The Value of Farm Accounts.

In all cases accounts are a valuable source of information, and in most cases they save money. One of the main objects in keeping accounts is that the farmer may know at regular intervals how he stands, and to what extent his farm is paying. Knowledge of the facts is the first step toward economy, and the proper control of expenses and of the whole financial side of the farm business.—H. G. Howell, in the *Journal of the Ministry of Agriculture*, London.

## Profitable Farming Depends on Three Things.

The profitableness of the farm business depends on three things—ample production, minimum cost of production, and adequate prices. Adequate production at minimum cost involves more efficient methods and economical operations. Factors in this are—better utilisation of the soil; more intelligent use of fertilisers; the use of better seed; the growing of more productive strains and varieties; better methods of preventing soil erosion; more effective methods of combating insect pests, plants, and animal diseases; the production of more and better grades of live stock; better utilisation of forage and roughage and waste materials on the farms; better maintenance of soil fertility by conserving soil moisture and manure; a greater use of legumes in rotations and as companion or intertilled crops; and the greater use of machinery and practical mechanical power on farms.

The problem of securing for the farmer prices which will enable him to maintain production is a more difficult one. Attention must be given to better and more economical methods of grading, storing, marketing, and distributing farm products. The Department of Agriculture is organised to develop each of these essential factors for making the business of farming more profitable by making production and marketing more efficient and economical.—E. T. Meredith, Secretary of Agriculture, U.S.A.

# Spraying as a Preventive for Blow-flies.

## Trials at Trangie Experiment Farm.

A. H. MacDOUGALL, Manager.

[The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw attention to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for two years. They are published now, it being recognised that the public are entitled to know the results obtained.]

The experiments in connection with the prevention of blow-fly attacks on sheep were continued this year, the same specifics being used as in previous years. The sheep used in the trials were 342 flock Merino breeding ewes that had been mated during November and December, 1919. They were divided into four groups, the treatment of the respective groups being as follows:—

Group 1.—Eighty-six sheep treated with a proprietary powder dip containing arsenic and sulphur.

Group 2.—Eighty-six sheep treated with 1 lb. arsenic to 50 gallons of water.

Group 3.—Eighty-five sheep treated with a proprietary liquid dip having carbolic acid as its basis.

Group 4.—Eighty-five sheep not treated, as a basis of comparison.

The sheep were sprayed in a race specially constructed for the purpose, a hand force-pump with hose and nozzle being used. The sheep were sprayed three times, viz., on 7th November, 30th December, and 10th February. At the first spraying two pints of each mixture were used on each sheep, at the second spraying two and a half pints, and at the third three pints. This increase was necessitated by the increase in the quantity of wool that had to be saturated on the second and third occasions. The blow-fly commenced to be active early in March, but as the sheep were then in poor condition and forward in lamb, no further spraying could be made.

During the latter end of March and the whole of the months of April and May, the flies were very numerous, and could hardly have been worse. In the stud flocks on the farm, men were daily employed solely dressing blown sheep.

The sheep used in these trials were allowed to go without treatment until it was necessary to treat them to save their lives.

It was observed that once a sheep was struck the dressings used appeared to make no difference in the way of reducing their destructive progress or their numbers. The benefit derived by the treatments appeared to be in the prevention of attacks, and in this respect the carbolic dip used on Group 3 stood out as the best used in the trials.

From my observations this season, I would recommend that once a sheep is observed to be affected it should be treated at once. The best method, I find, is to shear the affected part fairly close all round, and well into the unaffected wool, and apply the carbolic dip in the proportion of 1 part dip to 10 parts water. If the flesh is raw, a weaker dilution should be used.

The efficiency of the various applications is indicated by the number of sheep that had to be treated for blow-fly infestation after the sprayings had ceased. The records show that between 13th April and 19th May the numbers in the various groups that had to be treated and dressed for infestation were :—

| | Spraying Mixture. | No. Treated. | Percentage. |
|---|---|---|---|
| Group 1 ... | Proprietary dip containing arsenic and sulphur ... | 23 | 26·74 |
| ,, 2 ... | Simple arsenic solution ... | 23 | 26·74 |
| ,, 3 ... | Proprietary dip having carbolic acid as basis ... ... ... | 14 | 16·46 |
| ,, 4 ... | Not sprayed ... ... ... | 37 | 43·52 |

## The Castration of Lambs.

The operation of castrating lambs, as it is carried out by many farmers and station owners, lately came under the criticism of a farmer in the Taree district, on the grounds of the pain inflicted on the animals. The following paragraph on the subject, provided by the veterinary officers of the Stock Branch, will be of interest to owners of stock.

"The castration of all animals involves considerable pain, no matter what method is used. Ideally it could be largely prevented, but owing to economic and practical difficulties it is never likely to be entirely avoided. The method of castrating lambs by pulling with the teeth is simply one of custom, and could be replaced by cutting the spermatic cord in place of tearing it off. The fact that the blood-vessels are ruptured instead of being cut clean acts as a preventive to hæmorrhage, though this is not likely to be great with such young animals, and could be avoided by using a small emasculator. The use of the teeth could well be replaced by using small clamps. Theoretically, it is probable that more pain is inflicted by tearing than by simple cutting and crushing, and there is no doubt the old custom of pulling out by the teeth will gradually be superseded by the methods mentioned above, but the process will be slow, and depends on education. So far as the operation goes, there is no advantage in tearing out."

## A Dam that did not "Hold."

We have a new dam in red soil which does not hold quite as well as it should, though it is better since the sheep have trampled it in. Would you tell me how you would puddle it?

The question came from the central west, and the Department's Overseer of Works, presuming that the seepage was at the sides, advised the correspondent to cut a trench 18 inches wide and the full depth of the dam, and to fill this with clay, ramming each layer of 6 inches hard.

# Some Advantages of a Rough Surface in Cultivation.

J. T. PRIDHAM, Plant Breeder.

THE rough surface as a method of cultivation has been advocated in the past, and no apology is needed for introducing the subject afresh.

Conservation of moisture is only one of the objects of cultivation; though, perhaps, in our climate it is the most important. Soil texture is hardly less necessary for the growth of plants, for it ensures proper aeration for the feeding roots. A common notion of an ideal cultivated surface is that of the proverbial onion bed, but while we require a finely-divided soil for the germination of small seeds, the cultivation given after the seedling starts to grow should be somewhat different. If loose surface particles were the main object in cultivation a layer of sand should provide the right conditions. It has been noticed by the writer, however, that where sand has drifted or been washed over the surface the crop is not superior to that growing on the soil in its natural state, but rather the reverse. Of course, cases happen where the stormwater that accompanies the sand causes extra growth, but usually the effect is rather detrimental than otherwise. During the present season the abundant winter rains following the drought have, in some cases, caused the soil to go out of condition or to lose its tilth. A farmer who walks over his land likes to feel his heel sink into a soft soil. Land that does not give under the tread is deficient in texture, and the question arises how best to get the soil back in some degree to its previous condition during the current season.

A heavy harrowing will help to some extent in the case of wheat and such crops, but where inter-tillage is possible, as in orchards, and where crops are grown in rows, we can assist nature by the choice of suitable implements. A disc cultivator, or one that leaves the soil in fine condition, while valuable under certain conditions, is not called for where soil has become solidly crusted together or has become water-logged under the crop. A tool that produces the ideal surface is a pronged hoe, and among cultivators a machine with narrow teeth; in some soils the spring-tooth type does the best work. The aim should be to leave the surface covered with clods rather than in the fine condition in which it will run together again after the first rain. For weedy land, a machine that leaves the ground torn up in a ridged or corrugated condition is best.

Cultivating means that while the crop occupies the land we lose the use of the top 2 or 3 inches. In what form should this spare soil lie? A rough surface provides better percolation and drainage for rain, cooler conditions for the roots as the warm weather approaches, and better aeration, and consequently

increased bacterial action. Some soils remain cloddy throughout the season, but others are self-mulching, the clods gradually crumbling and providing fine moist soil some 3 inches down where it is most required by the rootlets.

A new light has been thrown on the subject of cultivation by Mr. C. M. Hutchinson, Imperial Agricultural Bacteriologist, at Pusa, India. In Bulletin 68, he says :—"During the cold weather in Bihar, when the rabi crops are in the ground, the nitrate formed in the soil is brought to the surface by the capillary rise and evaporation of soil water, so that in an untilled soil about 90 per cent. of the whole nitrate present in the first 18 inches of soil is concentrated in the first quarter-inch. This emphasises the need for cultivation during this period of the year, not only to minimise loss of water by evaporation, but to prevent the concentration of the available nitrogenous plant food in such a superficial layer, and the consequent formation of a shallow root system so characteristic of plants in a badly cultivated soil, and specially noticeable in the case of cold weather cereals of normally deep-rooting habit, such as wheat." The restriction of growth by caking of the surface is therefore not alone due to lack of soil aeration.

It has been remarked that seeds sown in a depression do not germinate nearly so well as those surmounted by a convex soil surface. The cause would appear to be lack of aeration and drainage. The ordinary wheat drill deposits the seed in a tiny hollow, with a ridge on either side of a row of grain. It has been our experience in hand-sowings of wheat that seed under a slight ridge comes up better than that sown in a hollow. If the drill was so constructed that the seed was deposited under a ridged surface a better germination would certainly follow in circumstances where a good fall of rain succeeded the sowing. Judgment must be exercised in regard to deep cultivation when the warm weather begins. If the lumps are too large, it means considerable evaporating surface and loss of moisture at a time when the crop can ill afford it.

It may seem like going into fine points and unnecessary expense for a farmer to have more than one type of plough and cultivator on his place, but we cannot expect fertilisers to do everything. Successful soil management consists in using the right class of implement just at the right time. With good selected seed and fertiliser, and reasonably good land, the farmer can be fairly sure of getting the best returns possible, provided he uses judgment in the working of his land. The mechanical condition of the soil is being more studied in conjunction with bacteriology, as we are coming to realise that it is by no means the lifeless, inert matter we used to think.

## Negro County Agents.

Extension work among negroes is now undertaken in the United States by the Department of Agriculture, 220 negro agents (163 men and 57 women) working for the increase of the agricultural output of their coloured people. The result is increasingly beneficial ; an officer of the Department records that the negro agent's work last year, in twenty-three counties of Virginia, reached 14,000 negro farmers.

# Farmers' Experiment Plots.

## POTATO EXPERIMENTS, 1919-20.

### Central Western District.

B. C. MEEK, Assistant Inspector of Agriculture.

THE following farmers co-operated with the Department in carrying out potato experiments during 1919-20:—

G. W. Kelly, Caves Roads, Oberon.
N. S Meek, Lindfield, Hobby's Yards.
W Burns, Goongawarrie, Carcoar.
E. Blackburn, Belar Creek, Warkton.
J. L. B Forster, Firenze, Coolah.*
J. I. Renshaw. Hampton Park, Binnaway.*
G. J. Douglas, Fairfield, Coonabarabran.*

The home of the potato is America, and the parts to which it is native are the cool, high regions with good rainfall. It will be noted in the following results that the higher the altitude and the better the rainfall the greater the returns.

Whole seed gave a remarkable increase in yield over cut seed of the same weight, which confirms similar results obtained in the previous year. Not only was the germination superior, but the plants looked to yield better at all stages of growth. Cultivation methods were similar in all cases, deep ploughing being practised in the autumn and the plots worked with cultivator and barrow as required between that time and sowing. Sets of from 1½ to 2 oz were sown in the furrows, about 4 inches in depth and 15 inches apart, the rows being 2 feet 6 inches apart. Manure was sown along the furrows by hand at the rate of 2 cwt. per acre.

Spring sowing was made at Warkton, but the other three areas were sown in November, the month in which sowing is generally made in those localities. Grub and scab were only moderately in evidence, the latter being that usually associated with alkaline soils. Fly (Rutherglen bug) must have considerably reduced the yields through attacking the young green shoots of the plants when at the early stage of growth. It was noticed that the fly exercised discrimination in the choice of food—damaging Satisfaction considerably more than Sussex and other coarse-growing varieties. Rabbits, though generally neglectful of potato tops in a normal season, also ate off the finer varieties, and passed by such as Blue Manhattan.

### Details of the Plots.

*Oberon.*—The area sown here has been in continuous cultivation for over twenty-five years, and constantly during that time either a winter or a summer crop has been raised, care being taken to grow cereals, peas, and potatoes, in rotation suited to its requirements and the market conditions. Sheep were used to graze off any vegetation between crops.

*At these places the season was so unfavourable as to necessitate the cancellation of the experiments.

*Hobby's Yards.*—The land here was pasture which had been broken up the season before for potatoes, but which had not been used. Ideal conditions were obtained for a good crop, but the early vigorous growth was checked by insufficient moisture during the flowering and growing time of the tuber.

*Carcoar.*—The same remark applies to the land here also, the crop being on an area which had been allowed to go back to grazing for a couple of years.

### The Varieties Reviewed.

Carman, Early Rose, and Manhattan have done well for several seasons, and Factor and Early Manistee are worthy of further trial. Up-to-Date, Queen of the Valley, and Surprise only seem to do well when the season is a long one. The consistently worst varieties are Sussex, Satisfaction, and Coronation, in that order, and these could well be eliminated from tests in the Central Tablelands. As the source of seed for the experimental plots varies, and no effort is made to improve or even maintain the productiveness of some varieties, it is quite probable that, given attention along these lines, the bad reputation of some may be reversed, as they must have had some qualification to recommend them when first produced and put upon the market.

Carman No. 1 was introduced into the Romsey (Vic.) district from America by Mr. H. W. Cook about 1895, and was used by this Department in 1913, as it was one of the best early varieties, giving general satisfaction. The potato called "Carman" in the tests under review is different to Carman No. 1 as first used, the tuber being more oblong in shape and the plant producing a greater growth of foliage.

Early Manistee—also an early American variety, and introduced by Mr. J. E. Cook (Vic.) in 1908—assumes a more flattened shape when grown on the tablelands.

Factor, an English variety, has a good clean skin with shallow eyes, and has superior table qualities to Up-to-Date, which it resembles.

RESULTS of Potato Variety Trials.*

| Variety. | Oberon. | | | | Hobby's Yards. | | | | Carcoar. | | | | Belar Creek. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Carman ... ... ... | 4 | 4 | 0 | 24 | 4 | 17 | 0 | 0 | 1 | 17 | 0 | 5 | 3 | 12 | 0 | 0 |
| Up-to-Date ... ... | 6 | 1 | 2 | 16 | 3 | 10 | 1 | 10 | 1 | 11 | 3 | 14 | 1 | 2 | 0 | 0 |
| Early Rose ... ... | 5 | 17 | 3 | 7 | 4 | 8 | 2 | 14 | | ......... | | | 1 | 16 | 0 | 0 |
| Queen of the Valley ... | 6 | 11 | 1 | 16 | 3 | 18 | 1 | 24 | 0 | 19 | 2 | 21 | | ......... | | |
| Surprise ... ... ... | 5 | 0 | 3 | 0 | 3 | 5 | 0 | 0 | 1 | 16 | 0 | 18 | | ......... | | |
| Manhattan ... ... | 5 | 7 | 2 | 24 | 2 | 9 | 3 | 18 | 1 | 7 | 2 | 14 | | ......... | | |
| Satisfaction ... .. | 2 | 14 | 3 | 4 | 2 | 2 | 1 | 0 | | ......... | | | 2 | 3 | 2 | 0 |
| Sussex ... ... ... | 2 | 19 | 0 | 20 | 1 | 18 | 2 | 4 | 0 | 14 | 0 | 7 | | ......... | | |
| Early Manistee ... ... | 4 | 13 | 2 | 6 | 3 | 9 | 0 | 20 | | ......... | | | | ......... | | |
| Brownell's Beauty ... | | ......... | | | 2 | 3 | 1 | 18 | 1 | 5 | 0 | 5 | | ......... | | |
| Factor ... ... ... | | ......... | | | | ......... | | | | ......... | | | 2 | 18 | 0 | 0 |
| Coronation ... ... | | ......... | | | | ......... | | | 1 | 4 | 0 | 12 | | ......... | | |

* The plots were fertilised with 2 cwt. P7 mixture (equal parts of superphosphate and bonedust) per acre.

RESULTS of Potato Manurial Trials (Variety, Manhattan).

| Manures and Mixtures. | Oberon. | | | | Hobby's Yards. | | | | Carcoar. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | . |
| 2 cwt. P8* ... ... ... | 5 | 5 | 2 | 26 | 2 | 11 | 3 | 2 | 1 | 12 | 3 | 7 |
| 2 cwt. P7* ... ... ... | 5 | 7 | 2 | 24 | 2 | 9 | 3 | 18 | 1 | 7 | 2 | 14 |
| 2 cwt. superphosphate ... | 5 | 5 | 2 | 26 | 2 | 8 | 3 | 0 | 1 | 3 | 2 | 25 |
| No manure ; whole seed ... | 4 | 3 | 0 | 12 | 2 | 6 | 1 | 20 | 1 | 5 | 0 | 5 |
| No manure ; cut seed ... | 3 | 0 | 0 | 27 | 1 | 10 | 3 | 0 | 0 | 18 | 0 | 20 |

* The mixture P8 consists of equal parts of superphosphate and blood and bone P7 consists of equal parts superphosphate and bonedust.

VALUES of different Fertilisers compared.

| Fertilisers and Price per ton. | Average Increase Yield due to Fertiliser. | Value of Increase at £15 per ton. | Cost of Fertiliser applied. | Net Gain. |
|---|---|---|---|---|
| | c. q. lb. | £ s. d. | £ s. d. | £ s. d. |
| P8 (£10 10s.) ... ... ... | 11 3 18 | 8 18 0 | 1 1 0 | 7 17 0 |
| P7 (£9 10s.) ... ... ... | 10 0 25 | 7 11 6 | 0 19 0 | 6 12 0 |
| Superphosphate (£5 12s. 6d.) .. | 7 3 14 | 5 18 0 | 0 11 3 | 5 6 9 |

RAINFALL during Growing Period.

| Month. | Oberon. | Hobby's Yards. | Carcoar. | Month. | Belar Creek. |
|---|---|---|---|---|---|
| 1919. | Points. | Points. | Points. | 1919. | Points. |
| November .. | Nil. | 91 | 38 | August ... | 120 |
| December ... | 349 | 237 | 229 | September ... | 20 |
| 1920. | | | | October ... | 45 |
| January ... | 282 | 212 | 234 | November .. | 42 |
| February ... | 64 | 26 | 55 | December ... | 83 |
| March ... | 141 | 95 | 74 | | |
| April ... ... | 220 | 176 | 169 | | |
| Total ... | 1,056 | 837 | 799 | Total ... | 310 |

## South Coast.

R. N. MAKIN, Inspector of Agriculture.

Two experimental plots of potatoes were sown on the South Coast last season : these were on the farms of Mr. J. H. Martin, Pambula, and Mr. E. T. Kelly, "Fairview," Bega.

Previous experience, extending over a period of ten years, has shown that a good deal of risk of loss generally attends the spring-sown crop, owing to the hot and rainy weather which usually obtains in December, when the crop is ready to be lifted, favouring the spread of wet rot. Such weather conditions marked last season, and heavy losses occurred, not only on the

experiment plots, but on farms throughout the whole length of the South Coast. Consequently many farmers found the Sydney market unsatisfactory, as buyers hesitated to purchase South Coast potatoes because of their unreliable keeping qualities.

Of the many potato crops grown in this district (on the experiment plots and elsewhere) during the last ten years, comparatively few have been found profitable, owing to losses due to fungus diseases. Certainly, instances can be quoted where excellent returns have been obtained when weather conditions have been favourable, but the experience of the Department is that other crops, such as maize, sorghum, millet, or vegetables like sweet potatoes, peas, or tomatoes, would have been more profitable. It might be stated that no experiments have been carried out in late sowings—say, in February. Such a planting—provided good seed could be secured—might prove more profitable, as the crop would mature in the cooler weather. As a rule, however, there would be difficulty in obtaining the seed for such a sowing. To plant an acre of potatoes, about 10 cwt. of seed is required, and this, added to the cost of preparing the ground and the subsequent cultivating, makes the venture an expensive one in comparison with other crops. In normal times, an acre of potatoes planted under average conditions represents an outlay of £7, but of late years, owing to the higher price of seed, the figure is much larger.

During the last ten years, the work on the potato experiment plots in this district has included trials of a good many varieties of potatoes and of a number of different mixtures of artificial manures in varying quantities. Perhaps some of the best results have been those obtained at Pambula, on Mr. J. H. Martin's farm. Of varieties, Manhattan and Satisfaction have been under test in five experiments, and have given an average yield of 5 tons 13 cwt. 3 qrs. 5 lb. and 4 tons 5 cwt. 3 qrs. 19 lb. per acre respectively. These returns are certainly good, but we found Manhattan a poor keeper and inclined to be soapy. Satisfaction, on the other hand, was of fair quality, but it was frequently found that the larger tubers were hollow in the centre and sometimes carried brown fleck. Four tests with Up-to-Date and Carman No. 1 returned an average of 4 tons 12 cwt. 26 lb. and 4 tons 18 cwt. 3 qrs. 19 lb. per acre respectively. These two white-skinned varieties have been very satisfactory at times, but a good deal of second growth has been noted occasionally. Three tests with Early Manistee yielded an average of 3 tons 9 cwt. 1 qr. 25 lb. per acre. While this variety is not a heavy yielder, it is perhaps the best as regards table quality, and, on account of its earliness, can be lifted before the December rains cause fungus troubles to become acute. Many other varieties have been tried, but those mentioned have been found to be the best.

In manuring the crops in tests over a period of five years, P5 mixture (4 parts superphosphate and 1 part sulphate of potash) gave an average return of 2 tons 2 cwt. 1 qr. 23 lb. per acre over the plots sown without manure. The quantity of this manure used was 2½ cwt. per acre, at a cost of about 17s. 6d. Not only was the yield increased by its application, but

the quality of potatoes from the manured plots was much superior. Mixtures containing bonedust and different quantities of superphosphate have also been tried and have all shown to advantage against the unmanured section, but the P5 mixture generally gave the best results.

During the past season the yields per acre from the two plots referred to were as follows :—

TABLE showing Results of Manurial Trials.

| Manure per acre. | E. T. Kelly, Bega. | | | | J. H. Martin, Pambula. | | | |
|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. |
| *P8, 3 cwt. ... ... ... | 1 | 13 | 0 | 0 | 7 | 8 | 1 | 4 |
| P5, 2½ cwt. ... .. ... | 1 | 8 | 0 | 0 | 7 | 5 | 1 | 20 |
| P7, 3 cwt. .. ... ... | 1 | 14 | 2 | 8 | 7 | 12 | 2 | 8 |
| No manure ... ... .. | 0 | 18 | 0 | 0 | 5 | 8 | 0 | 0 |
| Superphosphate, 5 cwt. . | 1 | 9 | 2 | 24 | 9 | 2 | 0 | 8 |
| ,, 4 cwt. .. | 1 | 10 | 3 | 20 | 8 | 12 | 0 | 16 |
| ,, 3 cwt. ... | 1 | 8 | 2 | 24 | 8 | 2 | 0 | 0 |

Rainfall, 13·22 inches.

* P5 mixture is made up of 4 parts superphosphate and 1 part sulphate of potash ; P7, of equal parts superphosphate and bonedust ; and P8, of equal parts superphosphate and blood and bone.

The Bega plot was on land that was covered by sand brought down by flood waters. It was thought by working the sand into the soil—a good alluvial deposit—good results would be obtained. The crop grew well but most of the tubers were lost by wet rot in December.

The Pambula plot was situated on a piece of ground which had not been cropped for many years, and was in fact practically new ground, having been built up by the silt brought down by flood waters. Nearly 8 inches of rain fell in December and the potatoes were starting to rot when they were dug.

The returns on the Pambula plot are interesting, inasmuch as the effect of the superphosphate was here most marked. No doubt the slower action of the bonedust in the P7 and P8 sections was accountable for the decreased yield in those sections, while the results on the P5 section show that the 2½ cwt. superphosphate used here was not enough.

On the Bega plots it will be seen the yields from the manured plots outstripped those from the unmanured plots in spectacular fashion. The P5 section looked particularly well ; as already mentioned, however, the crop practically rotted. The variety used in each place was Up-to-Date. No potato experiments are being conducted on the South Coast this season ; attention is to be given to more profitable crops.

## LUCERNE'S INCREASING POPULARITY IN CANADA.

LUCERNE is becoming one of the most important pasture and forage crops in Canada. In 1915, something like 98,000 acres were under lucerne, but last year the area had increased to 228,000 acres. In the province of Ontario this valuable crop is making rapid strides, the increase being from 60,000 acres in 1915 to 146,800 in 1919 ; in Quebec it was from 2,860 acres to 28,488 acres.

## Good Investments—Big Returns.

The Department of Agriculture through the work of these bureaus makes for its stockholders—the people of the United States—a profit of several times 1,000 per cent. per year for all the money invested in it. As evidence that it is paying big returns, I will give but a few typical items out of a large number that could be cited. We spent 250,000 dollars establishing durum wheat in this country. The durum wheat now produced in this country is worth 50,000,000 dollars a year. We spent less than 200,000 dollars introducing a rice and establishing the industry in California; the rice crop in that State is now worth 21,000,000 dollars a year. We spent 40,000 dollars introducing Egyptian cotton, breeding it up and establishing the industry in the arid regions of the south-west. The American–Egyptian cotton crop is now worth 20,000,000 dollars a year, and is increasing every year. We discovered a serum that prevents hog cholera, and its use, as demonstrated by the Department, has reduced the losses from that disease by 40,000,000 dollars a year.

We searched the world for grain crops that could be grown in the south-west where corn does not succeed. We spent a few thousand dollars in introducing the grain and forage sorghums. Last year 125,000,000 bushels of Kafir and other grain sorghums were produced there.—E. T. Meredith, Secretary of Agriculture, U.S.A.

## Grass, Millet, and Sorghum Trials at Prospect.

Mr. G. H. Boswell, Brighton Grove, Prospect, who, during last season, co-operated with the Department in carrying out trials with different fodder plants, obtained three cuts from Sudan grass, the crop at the first cut being 6 feet 6 inches high, at the second 4 feet 3 inches, and at the third 3 feet 9 inches. Of the sweet sorghums, Planter's Friend did best, reaching a height of 9 feet, while Saccaline only grew to 6 feet. Among the grain sorghums, Milo yielded very fine heads. As the grain makes excellent poultry-feed, poultry-farmers might well give this crop a trial. Among the millets, Japanese did best at 4 feet 6 inches high, and of the introduced grasses Perennial rye, *Paspalum dilatatum* (6 feet high), and Kentucky blue grass stood out prominently, while among the native grasses, the Love grasses (*Eragrostis* spp.) Kangaroo, Early Spring (*Eriochloa polystachya*), and *Danthonia* were very promising in appearance.—E. Breakwell.

## The Treatment of Roofing Iron.

I have a quantity of galvanized roofing iron that has been badly splashed with coal tar. How could I remove the tar and then cover the iron with paint or red oxide?

The reply of the Overseer of Works was that there was no need to remove the tar, as the red oxide would cover it. A paint made of boiled linseed oil and cement mixed together to the usual thickness of paint could also be used, being put on in the usual way.

# Notes on Wheats entered for the Royal Agricultural Society's Show.

## EASTER, 1920.

F. B. GUTHRIE AND G. W. NORRIS.

IN spite of the smallness of the harvest ot 1919–20 the number of individual entries (116) was only slightly lower than at Easter, 1919. The samples were all of good quality, with high gluten-content and bushel-weight, but were slightly lower on the whole in flour strength than last year. A new special class was added for a collection of strong-flour wheat (either red or white) for which prizes worth £20 were presented by a private firm, this amount bringing the total amount of prize-money allotted to this section to £170.

The prizes were on the whole fairly well distributed, seven exhibitors securing the twelve first prizes, while the eight second prizes were gained by six exhibitors. Of the exhibitors, Mr. W. H. Scholz was the most successful, securing three first prizes and two second prizes. Other competitors who gained two firsts were Mr. W. Clark, of South Australia, and Messrs. M. J. and W. F. D'Arcy.

Mr. Clark exhibited the grain with the highest bushel-weight, namely, Petatz Surprise. This grain has held the record for the heaviest wheat on several previous occasions ; this year it succeeded in obtaining first prize in its class. Mr. Clark also secured the first place in the Macaroni class with a consistent prize-winner in Indian Runner.

Amongst the new prize-winners are Messrs. Telford Bros., from Victoria, and Messrs. Lye and Wykes from this State.

The judges were Messrs. R. W. Harris (Gillespie Bros.) and G. W. Norris (Department of Agriculture), the milling of the samples being carried out by Mr. Norris.

The judging was carried out as in previous years. The bushel-weights of all samples were first taken : the results are given in the second of the tables which follow. After careful inspection to eliminate inferior exhibits, those which were considered eligible for prizes were milled in the model mill of the Department of Agriculture, and the prizes finally awarded in accordance with their actual behaviour in the mill, points being assigned for the different milling characteristics.

The results of these tests are given in the table headed "Results of Milling Tests," in which the figures within brackets are the actual figures obtained, the others being the marks assigned.

The following is the judges' report :—

The quality of the wheats is not quite as good as in recent years from the strength point of view. At the same time several exhibits are quite up to the usual standard. Speaking collectively, they are a heavy, uniform lot. The heaviest sample was of Petatz Surprise, weighing 68½ lb. to the bushel, and grown by W. Clark, South Australia. All exhibits were weighed in the new standard chondrometer.

A sample of Cedar exhibited by A. J. and W. H. Lye, of Tamworth, is a splendid specimen, yielding readily a flour of excellent colour and very high gluten content (16·7 per cent.). The sample of the Indian wheat Pusa No. 4, exhibited by W. H. Scholz, of Gilgandra, is worthy of mention. It yielded a high percentage of excellent colour flour of 53 quarts to the sack strength, which was the highest water absorption of all the flours tested in the competition. The appearance of several exhibits was depreciated through the effects of weevil, and in some cases it would appear that the sample had been kept from the previous season, and thereby spoilt the chance of scoring a prize. In the class for a collection of Farrer wheats, a very fine lot, exhibited by M. J. D'Arcy, of Berrigan, was spoilt through a sample of Bayah being riddled by weevils. It is also worthy of note that Yandilla King, grown by A. R. Michael (Victoria), was a particularly fine sample on appearance, but on being milled failed to secure a prize.

In the Macaroni class, W. Clark (South Australia) again won with Indian Runner, beating Telford Bros. (Victoria), who showed Kubanka. In strong red, Lye scored with Cedar, and the same variety scored second place for D. and J. Gagie.

With Pusa No. 4, W. H. Scholz beat his second exhibit of Comeback in the strong white class, which is an achievement for the Indian crossbred. Scholz again won in a class of five strong flour varieties with Cedar, Comeback, Punjab 9, Pusa 4, and Pusa 107, M. J. D'Arcy being second with Cedar, Comeback, Marquis, Kharkoff, and Pusa 4.

The medium strong class found the Florence variety the choice for first and second. W. F. D'Arcy won the specials for best bushel of Yandilla King and Hard Federation, and J. T. Wykes, Wellington, that for ordinary Federation. In the weak flour class, Petatz Surprise was placed first and Warren second.

The honours for five Farrer wheats went to W. H. Scholz, with Cedar, Comeback, Florence, Federation, and Warren, and those for five non-Farrer to M. J. D'Arcy, who showed Yandilla King, Marquis, Huron, Gresley, and Pusa 4, all grown on 6-inch rainfall.

In the collection of grain and ears, No. 6646 took first prize. The samples are well got up, as over 60 per cent. of the exhibit is of excellent quality. The remaining 40 per cent. shows signs of weathering, but still can be classed as good.

The ticketing and descriptive information was good.

Collection No. 6647 is a good exhibition from a collection point of view, but of inferior quality. About 40 per cent. is of show quality, the balance being dirty and of light bushel-weight, which spoilt the collection.

The third prize was not awarded, as in the opinion of the judges Nos. 6648 and 6649 were too small from a collection point of view.

The accompanying table showing the principal characteristics of the "strong-flour" and "weak-flour" wheats exhibited and their variations over a period of fifteen years may be of interest.

The weights per bushel are necessarily much higher than the f.a.q. weight for the corresponding years or the ordinary commercial samples, owing to the fact that the wheats are cleaned and graded carefully for exhibition purposes.

It will be seen that, although there is some fluctuation owing to seasonal conditions, the main factors on which the excellence of our wheats depend, maintain on the whole a high standard which shows no signs of deteriorating.

TABLE showing average bushel-weights, gluten-content, and water-absorbing power of wheats of the "Strong White" and "Soft White" classes milled at the Royal Agricultural Society's Show, from 1905-1920.

| Year. | Weight per bushel. | | Gluten. | | Flour Strength. (Water-absorption, quarts per 200 lb. sack.) | |
|---|---|---|---|---|---|---|
| | Strong White. | Soft White. | Strong White. | Soft White. | Strong White. | Soft White. |
| | lb. | lb. | per cent. | per cent. | | |
| 1905 | 63 | 64 | 10·0 | 9·7 | 46·6 | 45·2 |
| 1906 | 63¾ | 64½ | 11·0 | 9·8 | 48·5 | 45·7 |
| 1907 | 62½ | 66 | 9·3 | 8·3 | 48·4 | 45·4 |
| 1908 | 64½ | 65 | 12·2 | 10·2 | 52·5 | 46·4 |
| 1909 | 64¾ | 65¼ | 11·9 | 8·6 | 53·5 | 49·2 |
| 1910 | 64½ | 64 | 13·8 | 12·1 | 50·0 | 47·8 |
| 1911 | 64½ | 63½ | 12·5 | 11·0 | 53·4 | 47·0 |
| 1912 | 65 | 64 | 13·4 | 10·6 | 52·7 | 45·2 |
| 1913 | 67 | 65¼ | 15·2 | 11·7 | 53·1 | 46·9 |
| 1914 | 67¾ | 67 | 12·8 | 10·6 | 52·3 | 45·0 |
| 1915 | 67½ | 66½ | 13·1 | 12·4 | 53·8 | 45·7 |
| 1916 | 67¼ | 67¼ | 13·0 | 12·3 | 53·3 | 47·5 |
| 1917 | 66 | 67½ | 12·4 | 8·6 | 54·6 | 43·0 |
| 1918 | 67 | 65¾ | * | 10·2 | * | 44·5 |
| 1919 | 67½ | 66¼ | 10·5 | 8·9 | 52·7 | 43·6 |
| 1920 | 67 | 65½ | 13·6 | 11·5 | 51·3 | 44·7 |

* There were only two entries in the Strong White class in 1918, and these were readily differentiated by the judges without subjecting them to a milling test. The figures for gluten and flour strength are therefore not available.

## WEIGHTS PER BUSHEL.

| Catalogue No. | Variety. | Bushel-weight. lb. | Catalogue No. | Variety. | Bushel-weight. lb. |
|---|---|---|---|---|---|
| | | Class 943 (Macaroni Wheat). | | | |
| 6574 | Indian Runner ... ... | 63¾ | 6577 | Medeah ... ... ... | 63¼ |
| 6575 | Huguenot ... ... ... | 62¼ | 6578 | Kubanka ... ... ... | 65¾ |
| 6576 | Kubanka ... .. ... | 66¼ | 6579 | Huguenot ... .. ... | 62¾ |
| | | Class 944 (Strong Flour Red). | | | |
| 6580 | Marquis ... ... ... | — | 6585 | Cedar ... ... ... | 65½ |
| 6581 | Cedar ... ... ... | 67 | 6586 | Marquis ... ... ... | 65 |
| 6582 | ,, ... ... ... | 65¼ | 6587 | Cedar .. ... ... | 63¼ |
| 6583 | Marquis ... ... ... | 65¼ | 6588 | ,, ... ... ... | 67¾ |
| 6584 | Cedar ... ... ... | 65¾ | 6589 | ,, ... .. ... | 64½ |
| | | Class 945 (Strong White). | | | |
| 6590 | Comeback ... ... ... | 67½ | 6595 | Pusa No. 4 ... ... | 67 |
| 6591 | ,, ... ... ... | 66¼ | 6596 | Comeback ... ... ... | 67½ |
| 6592 | ,, ... ... ... | 67½ | 6597 | ,, ... ... ... | 65¾ |
| 6593 | ,, ... ... ... | 66 | 6598 | ,, ... ... ... | 67 |
| 6594 | ,, ... ... ... | 67½ | | | |

## WEIGHTS PER BUSHEL—*continued.*

| Catalogue No. | Variety. | Bushel-weight. lb. | Catalogue No. | Variety. | Bushel-weight. lb. |
|---|---|---|---|---|---|
| | **Class 946 (Medium Strong).** | | | | |
| 6602 | Canberra ... ... ... | — | 6609 | Yandilla King ... ... | 65 |
| 6603 | ,, ... ... ... | 63¾ | 6610 | Bunyip ... ... ... | 64¾ |
| 6604 | Florence ... ... ... | 64¼ | 6611 | Florence ... ... ... | 66½ |
| 6605 | Canberra ... ... .. | 65 | 6612 | Canberra ... ... ... | 66 |
| 6606 | ,, ... ... ... | 66¼ | 6613 | Marshall's No. 3 ... ... | 64¾ |
| 6607 | ,, ... ... ... | 63¾ | 6614 | Federation ... ... ... | 67½ |
| 6608 | Hard Federation ... ... | — | | | |
| | **Class 947 (Special Prize for Yandilla King).** | | | | |
| 6615 | Yandilla King ... ... | 67½ | 6618 | Yandilla King ... ... | 64¼ |
| 6616 | ,, ,, ... ... | 64¾ | 6619 | ,, ,, ... ... | 64¾ |
| 6617 | ,, ,, ... ... | 63½ | | | |
| | **Class 948 (Special Prize for Federation).** | | | | |
| 6620 | Federation ... ... ... | 63½ | 6624 | Federation ... ... ... | 64½ |
| 6621 | ,, ... ... ... | 65½ | 6625 | ,, ... ... ... | 64¼ |
| 6622 | ,, ... ... ... | 64 | 6626 | ,, ... ... ... | 67 |
| | **Class 949 (Special Prize for Hard Federation).** | | | | |
| 6627 | Hard Federation ... ... | 66¼ | 6630 | Hard Federation ... ... | 64¾ |
| 6628 | ,, ... ... | 63½ | 6631 | ,, ... ... | 65¾ |
| 6629 | ,, ... ... | 63 | | | |
| | **Class 950 (Weak Flour).** | | | | |
| 6632 | Petatz Surprise ... ... | 68¼ | 6636 | Major ... ... ... | 63 |
| 6633 | Warren ... ... ... | 66¼ | 6637 | Warren ... ... ... | 64¾ |
| 6634 | Jade... ... ... ... | 65½ | 6638 | Jade... ... ... ... | 66¼ |
| 6635 | Rattling Jack ... ... | 65¼ | | | |

## RESULTS OF MILLING TESTS.

| | Appearance of Grain. | Weight per bushel. | Ease of Milling. | Percentage of Flour. | Colour of Flour. | Percentage of dry Gluten. | Strength. | Total. |
|---|---|---|---|---|---|---|---|---|
| Maximum Marks. | 10 | 15 | 10 | 10 | 15 | 20 | 20 | 100 |
| Catalogue No. | **Class 944 (Strong Flour Red).** | | | | | | | |
| 6581 | 10 | [*67·0*] 14·5 | 8 | [*72·0*] 9 | 15 | [*12·0*] 16 | [*51·0*] 16 | 88·5 |
| 6583 | 10 | [*65¼*] 12·5 | 8 | [*72·5*] 10 | 12 | [*15·4*] 19 | [*46·6*] 12 | 83·5 |
| 6584 | 10 | [*65¾*] 13 | 8 | [*74·2*] 10 | 14 | [*14·4*] 18 | [*52·0*] 17 | 90·0 |
| 6585 | 10 | [*65½*] 13 | 8 | [*72·0*] 9 | 15 | [*16·7*] 20 | [*51·6*] 17 | 92·0 |

### RESULTS OF MILLING TESTS—*continued.*

| Catalogue No. | Appearance of Grain. | Weight per bushel. | Ease of Milling. | Percentage of Flour. | Colour of Flour. | Percentage of dry Gluten. | Strength. | Total. |
|---|---|---|---|---|---|---|---|---|
| Maximum Marks. | 10 | 15 | 10 | 10 | 15 | 20 | 20 | 100 |
| **Class 945 (Australian Strong White).** | | | | | | | | |
| 6592 | 9 | [67½] 15 | 8 | [73·7] 10 | 12 | [12·7] 16 | [52·4] 17 | 87·0 |
| 6593 | 10 | [66] 13·5 | 8 | [71·5] 9 | 14 | [15·0] 19 | [50·0] 15 | 88·5 |
| 6594 | 10 | [67½] 15·0 | 8 | [74·0] 10 | 13 | [14·0] 18 | [50·0] 15 | 89·0 |
| 6595 | 10 | [67] 14·5 | 8 | [73·7] 10 | 15 | [12·9] 17 | [53·0] 18 | 92·5 |
| **Class 946 (Medium Strong).** | | | | | | | | |
| 6604 | 10 | [64¼] 11·5 | 9 | [73·5] 10 | 15 | [14·4] 18 | [46·6] 12 | 85·5 |
| 6606 | 9 | [66¼] 13·5 | 10 | [71·7] 9 | 13 | [9·2] 13 | [45·4] 10 | 77·5 |
| 6607 | 9 | [63¾] 11·0 | 10 | [73·5] 10 | 15 | [13·4] 17 | [45·4] 10 | 82·0 |
| 6609 | 10 | [65] 12·5 | 10 | [71·2] 8 | 13 | [12·5] 16 | [44·8] 10 | 79·5 |
| 6610 | 8 | [64¾] 12·0 | 10 | [73·0] 10 | 13 | [12·4] 16 | [45·2] 10 | 79 |
| 6611 | 10 | [66½] 14·0 | 9 | [71·4] 8 | 12 | [13·6] 17 | [47·4] 13 | 83 |
| **Class 947 (Special Yandilla King).** | | | | | | | | |
| 6615 | 10 | [67½] 15 | 10 | [72·5] 10 | 14 | [12·4] 16 | [46] 11 | 86 |
| 6616 | 8 | [64¾] 12 | 10 | [74·5] 10 | 15 | [15·4] 19 | [45·4] 10 | 84 |
| **Class 948 (Special Federation Ordinary).** | | | | | | | | |
| 6621 | 10 | [65½] 13 | 10 | [73·0] 10 | 14 | [9·6] 13 | [45·0] 10 | 80 |
| 6626 | 9 | [67·0] 14·5 | 10 | [71·2] 8 | 15 | [10·8] 14 | [45·8] 11 | 81·5 |
| **Class 949 (Special Federation Hard).** | | | | | | | | |
| 6627 | 10 | [66¼] 13·5 | 9 | [71·7] 9 | 14 | [12·2] 16 | [49·6] 15 | 86·5 |
| 6628 | 10 | [63½] 11·0 | 9 | [72·5] 10 | 15 | [12·9] 17 | [48·0] 13 | 85·0 |
| **Class 950 (Weak Flour Wheats).** | | | | | | | | |
| 6632 | 10 | [68¼] 15 | 10 | [71·5] 9 | 14 | [10·4] 14 | [43·4] 9 | 81 |
| 6633 | 10 | [66¼] 13·5 | 10 | [71·7] 9 | 13 | [10·3] 14 | [45·8] 11 | 80·5 |
| 6633 | 9 | [65½] 13 | 10 | [71·5] 9 | 15 | [13·9] 14 | [45·0] 10 | 80 |
| 6637 | 10 | [64¾] 12 | 10 | [71·2] 8 | 14 | [11·5] 15 | [44·6] 10 | 79 |

**RESULTS OF EXAMINATION OF THE WHEATS IN CLASSES WHICH WERE NOT SUBJECTED TO MILLING TEST.**

| Catalogue No. | Variety. | Weight per bushel. | Appearance of Grain. | Trueness to Type. | Uniformity. | Total. |
|---|---|---|---|---|---|---|
| | Maximum Points. | 15 | 10 | 10 | 10 | 45 |
| | **Class 943 (Macaroni Wheat).** | | | | | |
| 6574 | Indian Runner ... ... | [63¾] 11 | 10 | 10 | 10 | 41 |
| 6575 | Huguenot ... ... .. | [62¼] 9·5 | 7 | 8 | 8 | 32·5 |
| 6576 | Kubanka .. ... ... | [66¼] 13·5 | 9 | 9 | 8 | 39·5 |
| 6577 | Medeah ... ... ... | [63¼] 10·5 | 9 | 10 | 9 | 38·5 |
| 6578 | Kubanka ... ... ... | [65¾] 13 | 9 | 9 | 9 | 40 |
| 6579 | Huguenot ... ... ... | [62¾] 10 | 7 | 7 | 7 | 31 |
| | **Class 945a (Collection of Five Strong Wheats).** | | | | | |
| 6599 | Kharkoff ... ... ... | [64¾] 12 | 8 | 9 | 9 | 38 |
| | Kitchener ... ... ... | [65½] 13 | 9 | 9 | 8 | 39 |
| | Marquis ... ... ... | [64¾] 12 | 8 | 8 | 8 | 36 |
| | Red Bobs ... ... ... | [64½] 12 | 8 | 9 | 9 | 38 |
| | Viscount ... ... ... | [65] 12·5 | 10 | 10 | 10 | 42·5 |
| | | | | | | 193·5 |
| 6600 | Cedar ... ... ... | [65½] 12·5 | 6 | 8 | 9 | 35·5 |
| | Comeback ... ... ... | [66] 13·5 | 10 | 10 | 10 | 43·5 |
| | Marquis ... ... ... | [66] 13·5 | 8 | 9 | 10 | 40·5 |
| | Kharkoff ... ... ... | [66] 13·5 | 9 | 9 | 10 | 41·5 |
| | Pusa No. 4 ... ... ... | [66] 13·5 | 10 | 10 | 10 | 43·5 |
| | | | | | | 204·5 |
| 6601 | Cedar ... ... ... | [68] 15 | 6 | 10 | 10 | 41 |
| | Comeback ... ... ... | [67] 14·5 | 10 | 10 | 10 | 44·5 |
| | Punjab Type ... ... | [66] 13·5 | 8 | 9 | 9 | 39·5 |
| | Pusa No 4 ... ... ... | [67¾] 15 | 10 | 10 | 10 | 45 |
| | Pusa 107 ... ... ... | [66¾] 14 | 10 | 10 | 10 | 44 |
| | | | | | | 214 |

RESULTS OF EXAMINATION OF WHEATS—*continued.*

| Catalogue No. | Variety. | Weight per bushel. | Appearance of Grain. | Trueness to Type. | Uniformity. | Total. |
|---|---|---|---|---|---|---|
| | Maximum Points. | 15 | 10 | 10 | 10 | 45 |
| | **Class 951 (Collection of Five Farrer Wheats).** | | | | | |
| 6640 | Cedar ... ... ... | [67¾] 15 | 6 | 10 | 10 | 41 |
| | Comeback ... ... ... | [67¼] 15 | 10 | 10 | 10 | 45 |
| | Federation ... ... ... | [64½] 12 | 10 | 10 | 10 | 42 |
| | Florence ... ... ... | [65½] 13 | 10 | 10 | 10 | 43 |
| | Warren ... ... ... | [65] 12·5 | 10 | 10 | 10 | 42·5 |
| | | | | | | 213·5 |
| 6641 | Canberra ... ... ... | [63¼] 10·5 | 8 | 8 | 9 | 35·5 |
| | Cedar ... ... ... | [64¼] 11·5 | 9 | 9 | 9 | 38·5 |
| | Comeback ... ... ... | [65¾] 13·5 | 9 | 9 | 9 | 40·5 |
| | Federation ... ... ... | [64] 11·5 | 8 | 10 | 9 | 38·5 |
| | Hard Federation ... ... | [62½] 10 | 8 | 8 | 9 | 35 |
| | | | | | | 188 |
| 6642 | Bobs ... ... ... ... | [65¼] 12·5 | 8 | 8 | 8 | 36·5 |
| | Comeback ... ... ... | [67½] 15 | 10 | 10 | 10 | 45 |
| | Federation ... ... ... | [67¼] 15 | 8 | 8 | 8 | 39 |
| | Jade ... ... ... | [66½] 14 | 8 | 8 | 9 | 39 |
| | Rymer ... ... ... | [65] 12·5 | 10 | 10 | 10 | 42·5 |
| | | | | | | 202 |
| 6639 | Bayah ... ... ... | [65¾] ... | Damaged by weevil. | ... | ... | ... |
| | Cedar ... ... ... | [65½] 13 | 10 | 10 | 10 | 43 |
| | Comeback ... ... . | [66] 3·5 | 9 | 9 | 9 | 40·5 |
| | Federation ... ... ... | [65½] 3 | 10 | 10 | 10 | 43 |
| | Warren ... ... ... | [65½] 13 | 10 | 10 | 10 | 43 |
| | | | | | | 169·5 |

RESULTS OF EXAMINATION OF WHEATS—*continued.*

| Catalogue No. | Variety. | Weight per bushel. | Appearance of Grain. | Trueness to Type. | Uniformity. | Total. |
|---|---|---|---|---|---|---|
| | Maximum Points. | 15 | 10 | 10 | 10 | 45 |
| | **Class 952 (Collection of Five Non-Farrer Wheats).** | | | | | |
| 6643 | Gresley ... ... ... | [*66¾*] 14 | 10 | 10 | 10 | 44 |
| | Huron ... ... ... | [*65¼*] 12·5 | 10 | 10 | 10 | 42·5 |
| | Marquis ... ... ... | [*65¾*] 13 | 9 | 9 | 9 | 40 |
| | Pusa No. 4 ... ... | [*65½*] 13 | 10 | 10 | 10 | 43 |
| | Yandilla King .. ... | [*66½*] 14 | 10 | 10 | 10 | 44 |
| | | | | | | 213·5 |
| 6644 | Marshall's No. 3 ... | [*67*] 14 | 6 | 10 | 10 | 40 |
| | Petatz Surprise ... | [*68*] 15 | 6 | 10 | 10 | 41 |
| | Punjab Type 9 ... | [*65½*] 13 | 9 | 10 | 10 | 42 |
| | Pusa No. 4 ... ... | [*66½*] 14 | 10 | 10 | 10 | 44 |
| | Pusa No. ... ... | [*66¾*] 14 | 9 | 10 | 10 | 43 |
| | | | | | | 210 |
| 6645 | Major ... ... ... | [*63¾*] 11 | 8 | 10 | 8 | 37 |
| | Marquis ... ... ... | [*62½*] 10 | 8 | 8 | 8 | 34 |
| | Marshall's No. 3 ... | [*64½*] 12 | 8 | 10 | 8 | 38 |
| | Roseworthy ... ... | [*62*] 9·5 | 8 | 10 | 8 | 35·5 |
| | Yandilla King ... ... | [*64½*] 12 | 7 | 10 | 10 | 39 |
| | | | | | | 183·5 |

## Awards.

**Class 943—** Macaroni.

First Prize, No. 6574—W. Clark ; Indian Runner ; grown at Angle Vale, South Australia, on sandy soil ; seed per acre, 75 lb. ; yield per acre, 20 bushels ; no record of rainfall ; fallow.

Second Prize, No. 6578—Telford Bros., Kubanka ; grown at St. Arnaud, Victoria ; on sandy loam ; seed per acre, 1 bushel ; yield per acre, 20 bushels ; rainfall during growth, 7 inches ; fallow.

**Class 944—** Strong Red.

First Prize, No. 6585—A. J. and W. H. Lye ; Cedar ; grown at Tamworth, on red loam ; seed per acre, 45 lb. ; yield per acre, 15 bushels ; rainfall during growth, 5·3 inches fallow.

Second Prize, No. 6584—D. & J. Gagie ; Cedar ; grown at West Wyalong, on sandy loam ; seed per acre, 30 lb. ; yield per acre, 4 bushels ; rainfall during growth, 4·56 inches ; fallow.

AWARDS—*continued.*

| | |
|---|---|
| **Class 945—** Strong White. | First Prize, No. 6595—W. H. Scholz; Pusa No. 4; grown at Gilgandra, on sandy loam; seed per acre, 32 lb.; yield per acre, 9 bushels; rainfall during growth, 5 inches; autumn ploughing.<br>Second Prize, No. 6594—W. H. Scholz; Comeback; grown at Gilgandra on sandy loam; seed per acre, 32 lb.; yield per acre, 12 bushels; rainfall during growth, 5 inches; autumn ploughing. |
| **Class 945a—** Five Strong Wheats. | First Prize No. 6601—W. H. Scholz; second prize, No. 6600—M. J. D'Arcy. |
| **Class 946—** Medium Strong. | First Prize, No. 6604—M. J. D'Arcy; Florence; grown at Berrigan on red loam, chocolate and clay; seed per acre, 60 lb.; yield per acre, 7½ bushels; rainfall during growth, 5·96 inches; fallow.<br>Second Prize, No. 6611—W. H. Scholz; Florence; grown at Gilgandra on sandy loam; seed per acre, 32 lb.; yield per acre, 14 bushels; rainfall during growth, 5 inches; autumn ploughing. |
| **Class 947—** Special Yandilla King. | No. 6615—W. F. D'Arcy; grown at Berrigan on red loam and clay; seed per acre, 45 lb.; yield per acre, 12 bushels; rainfall during growth, 5·96 inches; fallow. |
| **Class 948—** Special Federation (Ordinary.) | No. 6626—J. T. Wykes; grown at Wellington on red loam; seed per acre, 45 lb; yield per acre, 22 bushels; rainfall during growth, 4·5 inches; fallow. |
| **Class 949—** Special Federation Hard. | No. 6627—W. F. D'Arcy; grown at Berrigan on red loam and clay; seed per acre, 45 lb.; yield per acre, 8 bushels; rainfall during growth, 3 inches; autumn ploughing. |
| **Class 950—** Weak Flour. | First Prize, No. 6632—W. Clark; Petatz Surprise; grown at Angle Vale, South Australia; on sandy soil; seed per acre, 1 bushel; yield per acre, 15 bushels; no record of rain; fallow.<br>Second Prize, No. 6633—M. J. D'Arcy; Warren; grown at Berrigan on red loam, chocolate and clay; seed per acre, 45 lb.; yield per acre, 8½ bushels; rainfall during growth, 5·96 inches; fallow. |
| **Class 951—** Five Farrer Wheats. | First Prize, No. 6640—W. H. Scholz; Gilgandra; seed per acre, 32 lb.; yield per acre, Cedar and Warren, 10 bushels; Comeback, 12 bushels; Florence, 14 bushels; Federation, 16 bushels; rainfall during growth, 5 inches; autumn ploughing.<br>Second Prize, No. 6642—J. T. Wykes; Wellington; seed per acre, 45 lb.; yield per acre, Rymer, 19 bushels; Comeback, 18 bushels; Federation, 22 bushels; Jade, 21 bushels; Bobs, 17 bushels; rainfall during growth, 4·5 inches; fallow. |
| **Class 952—** Five non-Farrer Wheats. | First Prize, No. 6643—M. J. D'Arcy; Berrigan; seed per acre—Yandilla King, Marquis and Huron, 45 lb.; Gresley, 40 lb.; Pusa No. 4, 50 lb.; yield per acre, Yandilla King, 7 bushels; Marquis, 6 bushels; Huron and Pusa No. 4, 5 bushels; Gresley, 11 bushels; rainfall during growth, 5·96 inches; fallow. |
| **Class 952a—** Collection Grain and Ears. | First Prize, No. 6646—Sir J. H. Carruthers.<br>Second Prize, No. 6647—A. J. and W. H. Lye.<br>Third Prize—Not awarded. |

"THANK you for sending me 'The Thrift Plot in August.' . . . With the help of your booklets I hope to do better in future. I have learned why we only had 40 lb. of beans this year from beds that gave us 89 lb. last year, and in planning the garden for the coming season will rectify this mistake."—A Leichhardt lady in acknowledging a copy of the Department's vegetable leaflets.

# Flax-growing in Victoria.*

R. G. DOWNING, B.Sc. (Agr.), Acting Senior Experimentalist.

The growing of flax for seed alone has been attended with very similar results in Victoria to those obtained in New South Wales, and the Commonwealth Flax Committee does not recommend the crop for districts with a rainfall under 30 inches per annum.

It has been found possible, under such conditions, however, to obtain yields of both seed and flax fibre from the same crop, and in 1918 this resulted in an average yield of about 2 tons per acre on land with a capital value of about £25 per acre.

The system by which the Commonwealth Government takes over the crop from the grower, guaranteeing him a price per ton about three months before sowing time, means that the Government has to estimate the probable movement of the market at least two years ahead. Consequently the estimate has to be based on a somewhat conservative valuation, bonuses being paid in respect of any excess price that is realised. Thus fibre from the 1918 crop, when recently marketed in England, realised £325 per ton. The growers were paid the original guaranteed price of £5 per ton, but have also been paid one bonus of £2 per ton, and it is expected that at least another £2 per ton will be distributed.

It might be explained that from 1 ton of flax straw, as it leaves the farmers only 1 cwt. of fibre is usually obtained by the flax miller, though in some years the proportion is higher—1 cwt. of fibre being obtained from 15 cwt. of straw.

Mr. G. Wolff, who, besides planting about 20 acres with flax, runs a flax mill in Drouin, and who has been connected with the flax industry in Victoria for the last twenty-six years as both grower and miller, informed me that he considered the Government would have been quite safe in guaranteeing £10 instead of £6 per acre to the grower.

It is estimated that about 2,500 acres will be put under flax in Victoria this year. One of the most successful Victorian growers plants from 20 to 30 acres with flax each year, and in one year obtained 77 tons from 25 acres. This gentleman stresses thorough preparation of the land and early sowing in order to obtain any success. The crop should be at least 3 inches high before winter sets in, as the growth is checked very much by cold weather in the early stages. He recommends sowing at the rate of 60 lb. per acre, and prefers a fertiliser consisting of equal parts of bonedust and superphosphate, at about 1 cwt. per acre, rather than superphosphate alone, as heavy applications of the latter seem to encourage weeds in the early stages of the crop's growth.

Although continual growing of the crop on the same land is not recommended, one farmer in Gippsland has grown thirteen crops in fifteen years and the second last crop averaged 2½ tons per acre. A rotation is desirable, for most land tends to become dirty after one crop, and a fungus disease similar to "take-all" in wheat is liable to occur, when land is said to be "flax sick."

* Extracted from a report on a visit to the flax-growing districts of Victoria.

# Broom Millet on the Manning.

J. M. PITT, Assistant Inspector of Agriculture.

DURING the last few years broom millet growing has advanced to such proportions along the Manning River, that the Hunter River growers cannot at present be looked upon as having matters all their own way. The values ruling during 1918–1919 resulted in a larger area being sown during the spring of last season than perhaps in any year previous. Especially was this noticeable around the Mondrook, Glenthorne, and Mount George sectors.

The broom millet industry may be likened to a "cycle." The fibre deteriorates when stored for any length of time; consequently there is always a demand for the new brush by the various manufacturers. And because the fibre is used almost solely for broom-making, and the demand for brooms remains somewhat regular, so also is the demand for the fibre by these manufacturers a regular one. In normal seasons the supply and the market value likewise remain fairly regular. In years when droughts and floods devastate the main growing regions, as was the case in Victoria and on our own North Coastduring 1917–1918, the market becomes unsettled through supplies being insufficient, and consequently prices rise. Such tempting prices lead to increased sowings, the effect of which is that the market becomes over-supplied, and market values decline, with a reactionary effect on future sowings, until the market becomes normal—the cycle being repeated under the influence of weather conditions.

To turn out an attractive bale of the first quality requires some considerable experience, and a little more care perhaps than is required to fill a bag with maize or load a truck with pumpkins. There are many growers on the Hunter and Manning who grow the crop year in and year out, and with years of experience in the handling of the crop through its various stages, turn out an article which, beside paying handsomely, is worthy of the name. There are others, however, who, encouraged by tempting prices, try their hands, without more than the slightest idea of how to go about the work. Consequently inferior brush and low prices are obtained. To these growers the following notes, describing the procedure of experienced growers, may be useful.

## Climate and Soil.

Soils and climate suitable for the growing of maize are also adaptable for broom millet, and the alluvial flats of the Manning can be classed among the best. While it is admitted that maximum results are obtained from these rich soils, still payable crops can be produced on soils barely fertile enough for profitable grain production. Favourable conditions as regards moisture, warmth, and sunshine—a total absence of the former, and the maximum amount of the two last-named at harvesting time—are most essential for brush of the best quality. Less moisture probably is required

to produce a crop of millet than of maize; on the other hand, the ill-effects caused to maize by lack of moisture at tasselling time are less apparent with a millet crop, since it is grown primarily for the fibre.

Excessive moisture encourages blight, and has a detrimental effect on the quality and colour of the fibre, should rain fall on the "tabled" brush. Unfortunately a large number of crops, especially those later sown, suffered from both causes last season.

### Preparation of the Plot.

For districts subject to dry spells through the spring and early summer months, too much stress cannot be attached to the importance of adopting thorough methods of preparation—methods that aim at the conservation of moisture and the checking of weed growth. Sound methods allow of sowing at the right time, and through the moisture being conserved, longer periods of drought can be withstood than where less thorough methods are adopted.

**A section of a crop tabled.**
**Note the difficulty that would otherwise attach to harvesting the heads of the standing crop.**

Deep ploughing in the autumn with occasional workings with the disc or tine cultivator during the winter, and usually a shallower ploughing prior to sowing, are necessary. Where broom millet is continuously sown, or for that matter anywhere, a rotation, including a legume such as field peas or cowpeas, and also such other crops as turnips, pumpkins and cereals, should be adopted. The plant is a gross feeder, and should not successively be grown on the same portion of land. This fact is overlooked by the majority of growers.

### Sowing Operations.

Like other members of the sorghum family, broom millet is essentially a summer crop. The time to sow is regulated by weather conditions. Nothing is to be gained by sowing while the weather is cold or changeable; it is better deferred until warmer conditions set in. Mid-September is perhaps

the most suitable time, and sowings made then usually yield the heaviest and produce the best quality brush. In recent years late sowings have not always been successful, since the autumns have usually been wet and conducive to blight.

Rolling of the surface prior to sowing is generally practised; it enables the maize drill (with which the seed is sown) to work more satisfactorily, the seed to be sown at a uniform depth in the moist soil, and the large clods to be broken, thus enabling the subsequent cultural operations to be carried out earlier and without fear of damaging the young plants.

Where there is a possibility of much early weed growth or "nut weed," sowings are made in shallow furrows, previously opened with a small mould-board plough, or a single-horse cultivator with a suitable tine attached at the rear. The subsequent rolling and the cultivating given when the plants are 3 or 4 inches high gradually fill in the drill and smother weed growth.

Brush cut and laid all one way on tables to field cure.

An ideal plan would be to have the plants 4 to 6 inches apart, in drills, say, 3 feet apart. This latter distance allows of easy cultivation with a one-horse cultivator. Using a 10, 12 or 14 hole sorghum plate, according to the make of maize drill and the distance apart of the rows, gives satisfactory results. It requires from 3 to 4 lb. of seed per acre. Sowing into the moist soil about 1 inch is advisable.

The variety most widely grown is White Italian.

### Fertilising.

While not generally practised, it has been found beneficial, even on our richest soils, to apply about 1 cwt. of superphosphate per acre with the seed. Beside giving the plants a quick start—necessary when weeds are to be dealt with—it helps the crop to mature earlier, and in most instances increased yields are the result. At Mondrook much benefit has been derived from fertilisers, even when applied to the previous crop.

### After-cultivation.

Rain falling shortly after sowing often interferes with germination, and the crop sometimes requires re-sowing. However, this trouble may be averted if a light barrowing can be given soon to break the crust. Under ordinary conditions this operation is carried out a week or so after the plants are through. All early cultivations should be conducted preferably during the afternoon of sunny days. The plants are then least liable to injury: during the cooler hours of the morning they are brittle. Usually three or four cultivatings are given, chiefly after rain and when young weed growth is prevalent, discontinuing when the plants have grown to the stage when damage to the roots is to be feared.

A hackler driven by an oil engine on the farm of Mr. R. Richardson, Mondrock.

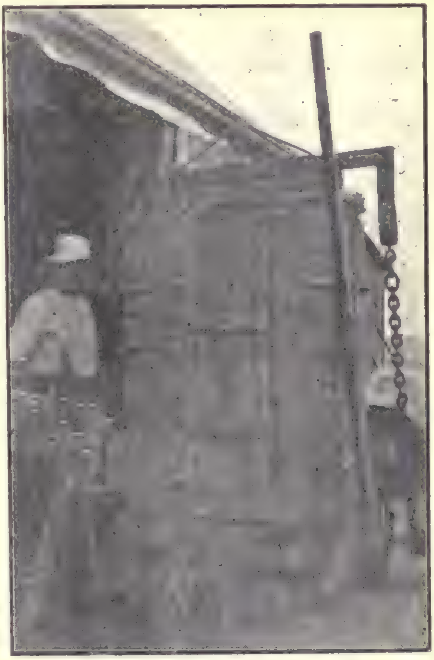
### Where the Seed comes from.

Before passing to the harvesting operations, a reference to the source of seed supply may not be out of place. The regular grower learns by experience that sowing seed from the "heap," where all classes are congregated, only results in poor yields, poor brush, and ultimately poor cheques. He usually goes through his crop beforehand, and this he is able to do owing to the fact that the heads are almost mature, and selects and cuts enough heads for next season's requirements. The points looked for are long, fine, straight, round fibre, and plenty of it; seed heads compact (to simplify hackling); and seed light-brown and full; heads true to a desired type and free from diseases. The heads are dried, hackled, and the seed put carefully away. To guard against weevil, a liberal quantity of naphthaline balls should be added to the bin or tin with the seed. To the casual grower it is not always possible to obtain seed in this way; therefore, it behoves him to obtain his supply only from the most reliable source.

### Harvesting.

While it is admitted that the best-coloured and finest-textured brush is obtained from the heads when the seed is immature, the Manning River farmers prefer to wait until the seed is quite firm. The brush has then, of course, lost its prime colour and is a little inferior in quality; but they maintain that in normal seasons this quality sells quite as readily as the prime, and they have the seed, which, since all poultry foodstuffs are dear, is in greater demand by poultry-farmers than formerly. Beside making up for the reduced quality of the brush, the value of the seed this season was sufficient to cover the harvesting of the whole crop.

The actual harvesting should be carried out in warm, dry weather; otherwise, the whole season's work may go for nought. "Tabling" is the first operation. Millet harvesting, owing to the plants averaging anything from 10 to 14 feet in height, would be rather a strenuous undertaking were it not for this. Hence it is that bending the plants over to bring the brush within reasonable distance of the knife is practised. The former method of bending in one or two places and bringing the brush to within a couple of feet of the ground (heads hanging downward) has been superseded by a more rapid and effective method. The farmer, bending two rows at the one time, places each row diagonally across each other, forming a latticed table about 3 feet from the ground. The work is simplified if the operator faces the direction of tabling. He is then in a position to accurately place the heads near the outside edges so that they are easily accessible for cutting.



Box press filled ready to be pressed.

The final operation of cutting is carried out by walking along the passages between the tables, and removing the head with about 6 inches of stalk, with a butcher's or some other suitable knife. The sheath enclosing the stem is removed at the same time. Beside hastening the process of drying, the removal of the sheath allows the reddish discoloration to dry out better, and it also deprives aphis of shelter. The heads are then placed in moderately thin layers on the "table" to dry, which usually takes from thirty-six to forty-eight hours according to the weather and the maturity of the crop. They are finally carted to the shed and placed neatly 9 to 12 inches deep (or more if advisable) on shelves. The crop is then ready for hackling.

### Hackling.

The most widely-used hackler is a locally-produced hand machine with a spiked drum. With the addition of extra fly-wheels, intermediates, and other makeshifts, gas engines and horses have been used satisfactorily for the driving power—considerably reducing the cost and saving time. At least three "hands" are necessary for hackling—the feeder, an assistant who arranges the bundles and hands them to the feeder (occasionally two are thus employed), and a help, who keeps up the supply of brush, removes the cleaned brush back to the shed, and clears the seed away from beneath the hackler.

First the millet is brought from the shed and placed on the receiving table with the heads facing the assistant, the small bundles, with eight to twelve heads in each, being more easily separated from the bulk when placed in

**Bale pressed, doors dropped, and bale ready to be removed.**

this way. As it is the seed that is to be dealt with, these parts are bunched together and the bundle placed in the feeder's left hand. Holding firmly, he places the heads on the fast revolving spiked drum and turns the bundle so as to bring all the seed in contact with the spikes, transferring it to the right hand when treated and thence to a table at the right of the machine, and receiving, as his left hand becomes free, another bunch from the assistant. The help at intervals removes the cleaned brush back to the shed and there packs it on the shelves, usually deeper than before and with all butts level. Here it is allowed to cure until baling time. The brush is more easily handled when being removed to the press if the butts are level, and it also binds better in the bales if packed while curing.

### Baling.

Very few farmers give this operation the attention it deserves. Grading is very seldom practised, most of the millet being pressed into self-working bales, composed of all grades, covers, hurl, insides, and bent and inferior heads in various proportions. Farmers contend that grading into separate bales not only necessitates extra labour and loss of time, but that the extra price received for the graded article is not sufficiently encouraging to warrant such treatment; also that the self-working bale sells readily enough.

Several types of press are brought into use. They are mostly hay presses fitted with makeshift contrivances to suit the work. The most satisfactory type is the box-press (an implement somewhat resembling a wool-press), which keeps the butts even, makes an attractive bale, and is simple to operate. A bale weighing approximately $2\frac{1}{2}$ cwt. is the usual size.

### Broom Making.

Beside being a district where broom millet is extensively grown, the Manning is one of the few centres that can boast of a broom factory, one having been established at Tinonee some nine years ago.


Locally Manufactured Brooms, Manning River.

As many as twelve different types of broom are manufactured at Tinonee, varying according to the quality and quantity of brush used and the class of finish desired. For instance, a "domestic" comprises the greatest quantity of best-quality brush, braces, velvet and lock finish, and six rows of sewing, whereas a "four-hurl" broom contains a smaller quantity of brush of inferior quality and only three lines of sewing, inferior finish and no locks.

The main operations are briefly :—

*Bleaching.*—The brush is placed in sulphur tanks to make the colour uniform, to clean and bleach, and to destroy pests.

*Sorting.*—This comprises grading into hurl, covers, and insides, and preparing the hurl for the outside.

*Assembling.*—Fixing the insides, then the shoulders (with covers), covering with inside and outside, and wiring. The broom is then ready for sewing, after which the ends are again hackled to remove stray seed or loose fibre. This operation also helps to straighten the fibre. The ends are then cut level, and the brooms branded and packed into dozen lots.

It is a peculiarity of the average Australian that an imported article is often given preference over the one locally produced, and the Manning River householders and storekeepers are not exceptions. Imported brooms—even brooms of Japanese manufacture—are stocked, although far inferior to the local production.

*Pests.*—The commonest pests and diseases to which broom millet is subject are aphis, red discoloration, smut, and leaf blight. The first two are always present. Blight, which is caused chiefly by excessive moisture, is worst with the later sown crops. As far as is known, very little (beyond early sowing to avoid blight) can be done to combat the pests.

## Pure-seed Growers Recommended by the Department.

The following list of growers of pure seed of different varieties of farm crops is compiled to indicate where pure seed is at present available. The list is compiled on recommendations made after an inspection by a field officer of the Department.

*Maize* :—

| | |
|---|---|
| Silver King (ungraded) ... ... | A. Sommerlad, Hillcrest, Tenterfield. |
| U.S. 133 ... .. ... ... | P. Gersbach, Farm 330, Leeton. |
| Brewer's Yellow Dent ... ... | H. Mauser, Sunnyside, Tenterfield. |
| Early Yellow Dent ... ... | Manager, Experiment Farm, Glen Innes. |
| Silvermine ... ... .. ... | Manager, Experiment Farm, Yanco. |
| Funk's Yellow Dent ... ... | A. E. R. Tiffen, Farm 319, Leeton. |
| Small Red Hogan... ... ... | H. Short, Dorrigo. |
| Craig Mitchell (ungraded) ... | W. D. K. Humphries, Muswellbrook. |
| Goldmine ... ... ... ... | A. Louttit, Moruya. |
| Boone County White ... ... | J. Chittick, Kangaroo Valley. |
| Leaming ... ... ... ... | Manager, Experiment Farm, Grafton. |
| Golden Beauty .. ... ... | R. Richardson, Mondrook, Tinonee. |
| Golden Nugget ... ... ... | J. W. Smith, Wauchope. |
| Early Clarence ... ... ... | F. Dowling, Tumut. |
| Giant White, Manning or Macleay White. | A. McM. Singleton, Henley, Sydney. |
| Improved Yellow Dent ... ... | Manager, Experiment Farm, Grafton. |
| Golden King .. ... ... | E. Blackburn, Warkton, Coonabarabran. |
| Red Hogan... ... .. .. | Principal, Hawkesbury Agricultural College, Richmond. |

*Sweet Corn* :—

| | |
|---|---|
| Papago ... ... ... ... | R. Yates, Ourimbah. |

*Elephant Grass* (cuttings) :—

Principal, Hawkesbury Agricultural College, Richmond.
Manager, Experiment Farm, Grafton.
Manager, Experiment Farm, Lismore.
Manager, Experiment Farm, Yanco.

*Kikuyu Grass* (roots) :—

Principal, Hawkesbury Agricultural College, Richmond.

*Grain Sorghums* :—

| | |
|---|---|
| Milo... ... ... ... ... | J. T. Maunder, The Wilgas, Pallamallawa. |

*Sweet Sorghums* :—

| | |
|---|---|
| Saccaline ... ... ... ... | Manager, Experiment Farm, Lismore. |
| ,, .. ... ... ... | Principal, Hawkesbury Agricultural College, Richmond. |

*Clovers* :—

| | |
|---|---|
| Shearman's Clover (roots) ... | J. H. Shearman, Fullerton Cove, Stockton, *via* Newcastle. |

# Chats about the Prickly Pear.

## No. 6.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist and Director, Botanic Gardens, Sydney.

### Pear as Stock Food in the United States—*continued.*

### C.—Working Cattle.

*Pear for Fattening and Maintaining Cattle.*—Under the above heading, Dr. D. Griffiths, in U.S. Bulletin No. 74, p. 24, writes as follows:—

Since the early days when teaming was much more extensively practised than at the present time, the bulk of the pear feeding in southern Texas has been done either to maintain stock or to prepare them for the market. While feeding cactus to dairy cows and work oxen is common all over the pear region, the amount fed for these purposes is insignificant compared with that used for maintenance and fattening. By far the greatest amount is fed as an emergency ration to keep cattle alive during a severe and prolonged drought. . . . . The rancher with small means is often caught with his cattle so poor that he cannot think of moving them to better pastures, even if he has the means and can find the feed. . . . .

It is in an emergency of this kind that the prickly pear and other forms of cactus become a boon to the rancher. It is owing to the existence of the prickly pear that the success of the rancher in southern Texas is largely due. A score of ranchers have acknowledged to the writer during the past year that were it not for pear they would have to move their cattle out of the country once every four or five years on account of droughts. . . . It is as good at one time as another, and can be fed by him at a couple of days' notice under any circumstances, although it is the general belief that it is much more valuable in winter than in summer.

*Pear as a Ration for Working Animals.*—This is specifically dealt with at p. 30 of U.S. Bulletin No. 74 (D. Griffiths). Following are extracts:—

The animals best adapted to working on pear appear to be oxen. They often work for months upon no other feed than dry grass, brush, and prickly pear · Even now a large number of Mexican wood-choppers (with bullock carts) in the extreme south-western part of Texas use no other feed than pear and what grass or browse the country affords. Often the grass and browse are very small in quantity. These people simply scorch the thorns off with brush, although many of them do not even go to this trouble, as they simply slash into the plants with a machete enough to give the animals a start into the clumps.

A day spent upon the market plaza at Laredo (Tex.) confirmed the statement which had been often heard regarding the large use made of pear by Mexican wood-choppers. When the men are asked what they feed, the answer invariably is "nopal" (prickly pear). One, of whom special inquiry was made, stated that he was hauling wood 30 miles (round trip), making two trips per week. His loads averaged three-fourths of a cord of mesquite wood. His oxen grazed very largely on grass at that time, but the greater part of the year they got little besides nopal, the thorns being singed off over a brush fire. His team was in good working condition.

*Effect of Pear on Stock.*—On p. 33, U.S. Bulletin No. 74, Dr. Griffiths remarks:—

The views of ranchers are so much at variance regarding many points relating to cactus feeding that it is impossible to form a definite opinion regarding many features of the practice. There is a comparative unanimity,

however, upon many points. There is need of experiments for their verification, for popular experiences and opinions are too indefinite and unsatisfactory.

Stockmen are very generally agreed that pear should be fed very gradually at first, many claiming that a week should elapse before a full ration can be safely fed. The reasons for this, however, will vary with the individual and the locality. Mr. Sinclair has abundant evidence that bloat is very easily caused in cattle that are not accustomed to the feed. Really, cattle look as though they were bloated after every feed, for the quantity eaten (125 to 200 lb. a day) is bound to cause a large distention of the stomach; but there appears to be no danger after the animals have become accustomed to eating it.

Stock fed on a full ration of pear scour more or less all of the time, and the injury from this source is, of course, very much aggravated if the cattle receive rough treatment. A half ration, with some drier roughage, such as sorghum hay, or even dry grass or browse, appears to produce less serious effects. This condition could not be otherwise with such sloppy feed. It occurs invariably with beet pulp, and the effects are probably very similar.

The condition of stock which have received pear during the winter appears to be very much better than that of those wintered on good dry-grass pastures. Feeders without exception make this observation.

Ranchers in Texas often lose a small number of cattle from the effect of the accumulation of fibre of the pear in the stomach. This condition is said never to occur with chopped pear, but to be common in cases where a pear burner or machete is used, and still more common in cattle which are forced to eat a large amount of pear in short pastures during dry seasons. The balls are said to be made up entirely of the fibre and spines of the pear.

No manner of feeding cactus yet devised, without greater care than the feeder is usually willing to bestow upon the work, does away entirely with the evil effect of the spines. Singeing with a torch or brush is the most effectual in this regard, if sufficient care is taken by the operator. In practice, however, very little attention is paid to the small spines, the effort being to burn off the distal three-fourths of the large ones, leaving most of the small ones for the stock to contend with. Indeed, there is a prejudice—whether well founded or not it has been impossible to determine—against pear scorched to the extent necessary to ensure the removal of all the small spines. It is claimed that cattle scour much worse upon pear which has been excessively scorched by either torch or brush flame.

The question of singeing the spines has been dealt with in Chat No. 3 of this series. Reference is also made in the extensive section labelled "As a Stock Food," at p. 10 of Bulletin 78 (1911), New Mexico (E. O. Wooton). Discussing the local conditions at p. 12, the writer says:—

On the stock ranges of New Mexico to-day are large quantities of prickly pear which have a value as forage, and this crop is especially valuable in the times of drought which visit all parts of the State at more or less irregular intervals. This forage, while it is not as good as grama grass, is much better than nothing, and in dry years the feed is reduced to cactus or nothing. In the past it has been the custom of stockmen to taking the "nothing" and let the cactus remain where it is. There have been two or three apparently sufficient reasons for this, as follows:—First, the cattle are not accustomed to eat the cacti, and would have to be taught to use it; second, when they are forced to take to a cactus diet they are weak, and the scouring due to the large quantities of inorganic salts taken with this kind of food is said to still further weaken them, thus increasing the loss; third, there is some work and expense connected with the preparation of the cacti for use by the stock. Since this seems like putting more money into a proposition which is bound to lose anyhow, most of the stockmen sell off what they can get to walk off the range, and trust to luck that some of the others will pull through, and pocket their losses.

It seems to the author that a better plan would be to accustom one's stock to eating cactus as part of the ration all the time, thus obviating the first, and to some extent, the second difficulty. And the work necessary to accustom stock to the practice would also accustom the man to the work and would

necessitate the purchase of all needful tools or apparatus. If this were done little by little during a period when forage was normally abundant, the expense and labour would hardly be felt, and the stock would gradually acquire the habit and learn to like the feed. Then, when the drought came, there would be little change in the whole procedure except an increase in the amount of cactus fed. A small amount of prickly pear is said to be good for young stock for toning them up, especially if they have been on dry feed for a long time. Thus, by a small outlay for tools and a little work, the stockman would be able to turn to good use that which is now considered useless and more or less of a nuisance.

## Summary as to Pear Feeding.

It will be useful at this place to give the greater portion of the summary of evidence in regard to pear feeding in the United States, to be found at p. 43 of U.S. Bulletin No. 74 (1905). It will be found most valuable. The farmers of south-western Texas have no doubt as to the value of prickly pear as cattle-feed, and they go so far as to give a warning lest the feeding operations should proceed so far as to endanger the permanence of the pear. We in Australia have not got to the stage when we can display anxiety on this point, and to what extent this is because of our sparser population as compared with that of Texas I do not know. At all events, I do not think I can be accused of raising undue hopes when I ask whether our landowners in pear country are developing the feeding of pear to stock to the extent that they might. But the matter is wrapped up in the fact that Australian farmers must see that they get the best machines and other appliances to work the pear. The problem is quite difficult enough without taking avoidable chances.

Data secured from popular sources appear to warrant the following conclusions, many of which are reservedly stated; it is hoped they can be experimentally verified in the near future:—

Prickly pear, although poor in nutritive quality, can be fed to decided advantage under several conditions and for several purposes:—(1) To save cattle during a prolonged drought, when other more nutritious feed is scarce. (2) To fatten cattle, when employed as a roughage with more concentrated feed. (3) When fed with more concentrated foods and some hay or pasture, it is a valuable accessory to the dairy ration; it supplies succulence which it is difficult to secure in semi-arid regions in a large part of the year. (4) Oxen can be worked on a ration consisting very largely of pear for an indefinite period.

A full-grown steer fed on pear alone will consume from 125 to 200 lb. daily. Mature steers, accustomed to a pear diet, can live in a pear pasture a long time without water. Oxen worked on pear drink water two or three times a week in summer and once a week in winter.

A good milk ration of pear, with plenty of other nutritious feed, will consist of from 40 to 70 lb. of pear for each animal a day.

Pear, fed whole, especially when stock has little else to eat, is likely to form fibre balls and kill a small percentage of cattle during prolonged feeding.

Pear, when burned, scours cattle much worse than when it is simply scorched enough to take the thorns off.

Prickly pear may be fed in a variety of ways:—(1) Cattle accustomed to pear eat more or less of it during the entire year, whether there is plenty of other feed or not, and with no preparation. (2) The thorns may be scorched off with brush. (3) The thorns may be scorched off with a gasoline torch—a modified plumber's torch. (4) The edges of the joints may be trimmed off with a machete (a Mexican knife), when stock, especially sheep and goats, gain access to the pulpy mass at an advantage. (5) The plants may be piled

in heaps in a field and chopped into small pieces with a machete. (6) The whole plant may be chopped into pieces ½ to 1 inch long with machines prepared for that purpose. (7) In some localities the whole plant is steamed in large vats to render the spines innocuous.

A cow with calf, fed with prickly pear alone, will lose flesh very rapidly.

Cotton-seed meal or cake and cotton-seed (cotton-seed is, of course, abundant in the southern States) appear to be well adapted to feeding with pear.

Hogs fatten well on the fruit of prickly pear, and they take kindly to a ration of prickly pear when the thorns are properly singed off.

Stock fed on prickly pear and cotton-seed products are said to suffer heavy shrinkage on the way to market.

Pear as feed for stock is of sufficient value to warrant investigations for the purpose of determining—1. Its exact value as food for both man and beast. 2. The nature and cause of the rapid fermentation in the chopped material. 3. The comparative value of different species. 4. The comparative value of old and new growth. 5. The exact influence upon quantity and quality of milk.

The old woody stems are preferred by feeders to the young joints.

When fed for succulence, as is the case in dry weather, the young nopals (pears) are of more value than when a maintenance or fattening ration is desired.

Pear has been fed in Texas since the early Spanish occupation.

Pear is better feed from the time that frost strikes it in the fall (autumn) until it begins to grow in the spring than in other seasons.

Cattle and working oxen will eat a large ration of pear, properly prepared, when there is an abundance of the best of green grass for them to eat.

Pear has a decided value in toning up the system of cattle that have lived on dry grass for several months. Two-year-olds especially are benefited by a partial ration of it for a short time.

All cattle, sheep, and goats soon become accustomed to eating pear. The sound of the pear machete or the sight of smoke in the pastures where stock are fed attracts the entire herd immediately.

The greatest promise for pear is in the line of milk production. The value of the succulence for the winter months will probably pay for the propagation of small acreages for this purpose.

Burning with a pear-burner tends to kill out the pear if close pasturing is practised afterwards.

When fed a full roughage ration of pear, cattle scour more or less all the time.

Inquiry at hide establishments and stock markets fails to reveal any serious injury done by the spines to commercial cattle products, although the spines work into the flesh considerably.

Cattle fed on pear chopped with a machete, and not burned, often get their mouth so full of spines that after a time they are unable to eat at all.

The crushing action of the chopping machine renders the spines innocuous.

The pear has two characteristics which render it especially valuable for pastures—1. It can withstand long periods of drought without injury. It has limitations, however, in drought resistance. It has been severely injured during some droughts within the memory of the present generation. 2. It is protected by spines, so that it cannot be materially injured by over-grazing without artificial preparation. A thornless pear in a pasture grazed the entire year would soon be exterminated.

The destruction of the pear in south-western Texas would be a severe calamity to the stock industry.

In practice, pear is very seldom fed alone. Even during the severest drought cattle are able to pick up some old grass and get a little browse from the abundance of brush that exists throughout the pear region. It is seldom that the Texas rancher feeds it without some cotton-seed meal, although the cactus of south-western Colorado has usually been fed alone.

Altogether the evidence suggests that feeding tests with prickly pear might be conducted with advantage in New South Wales.

# Production of Fourteen Herds Compared.

## FARMS ON BODALLA ESTATE.

L. T. MACINNES, Dairy Expert.

AN interesting comparison of the results obtained from the various herds on the Bodalla estate is afforded by the figures given below. In all, nearly 1,000 cows are milked in the fourteen herds on the estate, and during the twelve months just ended the total production of milk and of butter-fat from each farm was recorded, enabling the results on each farm to be compared with the rest. The herds are the result of systematic culling for a number of years, but the cows are kept under natural conditions, no hand-feeding being adopted except with green fodder crops when necessary. The averages of the seven leading herds compare favourably with the best of the herds tested on the North Coast, but it is unquestionable that the improvement of the herds could be greatly hastened by the individual testing of the cows every thirty days. The present system of keeping records indicates the merit of each herd, but the value of every unit in those herds is not so well known. The testing of the 1,000 cows would keep a tester going about three weeks in every month, but undoubtedly it would be profitable.

As to the results, the position of the pure-bred Friesian herd at the Home Farm is as interesting as that of the Grade Friesians in second place.

In the second table is shown how the milk from each farm is disposed of. The butter-fat is ascertained from samples taken from the bulk vats of milk delivered night and morning.

AVERAGE Production per Cow per Farm on Bodalla Estate.

| Name of Farm. | Breed. | No. of Cows in herd. | Average lactation period. | Average per Cow. Milk. | Test. | Fat. |
|---|---|---|---|---|---|---|
| | | | days. | lb. | per cent. | lb. |
| Home Farm ... | Friesian ... ... | 85 | 304 | 7,468 | 3·59 | 268·1 |
| Comerang ... | ,, Grade ... | 87 | 297 | 7,143 | 3·67 | 262·04 |
| Trunketabella ... | Ayrshire ... ... | 82 | 280 | 6,836 | 3·85 | 263·18 |
| Widgett... ... | Shorthorn Red ... | 58 | 289 | 6,315 | 3·59 | 226·71 |
| Greenway ... | Friesian and Ayrshire.. | 74 | 276 | 6,293 | 3·85 | 242·28 |
| Central Bails ... | Shorthorn Grade ... | 80 | 287 | 6,029 | 3·85 | 232·12 |
| Long Point ... | Guernsey ,, .. | 66 | 287 | 5,831 | 3·97 | 231·49 |
| Greenwood Park. | Shorthorn Roan .. | 82 | 276 | 5,463 | 3·80 | 207·59 |
| Bumbo ... ... | Jersey Grade ... ... | 51 | 257 | 5,109 | 4·08 | 208·45 |
| Long Flat ... | Ayrshire ,, ... | 78 | 280 | 4,848 | 3·98 | 192·95 |
| Cooper's Island... | ,, ,, ... | 75 | 277 | 4,789 | 3·85 | 184·38 |
| Gannon's Point... | ,, Red ... ... | 44 | 257 | 4,735 | 3·94 | 186·56 |
| Blind Neds ... | Friesian Jersey ... | 62 | 300 | 4,634 | 4·19 | 194·16 |
| Riverview ... | Culls from all Farms... | 59 | 235 | 3,819 | 3·75 | 143·21 |
| Grand averages ... ... ... | | | 280·6 | 5,781 | 3·8 | 221·1 |

PRODUCTION of each Farm on Bodalla Estate.

| Name of Farm. | Breed. | Average No. of Milking Cows. | Average No. of Dry Cows. | Total Cows. | Calf Milk. | House Milk and Sales. | Factory Milk. | Total Milk. | Butter-fat. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | lb. | lb. | lb. | lb. | lb. |
| Home Farm .. | Friesian .. .. | 71 | 14 | 85 | 81,630 | 3,200 | 549,980 | 634,810 | 22,789·7 |
| Comerang .. | ,, Grade .. | 71 | 16 | 87 | 5,260 | 3,120 | 613,090 | 621,470 | 22,808· |
| Trunketabella .. | Ayrshire .. .. | 63 | 19 | 82 | 129,120 | 2,460 | 429,050 | 560,630 | 21,584·3 |
| Widgett .. .. | Shorthorn Red .. | 46 | 12 | 58 | 7,730 | 2,080 | 356,460 | 366,270 | 13,149·1 |
| Greenway .. | Friesian and Ayrshire | 56 | 18 | 74 | 4,810 | 2,100 | 458,780 | 465,690 | 17,929·1 |
| Central Bails .. | Shorthorn Grade .. | 63 | 17 | 80 | 8,300 | 49,990 | 424,000 | 482,290 | 18,568·2 |
| Long Point . | Guernsey ,, .. | 52 | 14 | 66 | ... | 2,280 | 382,570 | 384,850 | 15,278·5 |
| Greenwood Park. | Shorthorn Roan .. | 62 | 20 | 82 | 75,340 | 5,060 | 367,580 | 447,980 | 17,023·2 |
| Bumbo . .. | Jersey Grade .. .. | 36 | 15 | 51 | .... | 2,080 | 258,480 | 260,560 | 10,630·9 |
| Long Flat .. | Ayrshire ,, .. .. | 60 | 18 | 78 | .... | 2,080 | 376,070 | 378,150 | 15,050·4 |
| Cooper's Island .. | ,, ,, .. .. | 57 | 18 | 75 | 2,220 | 2,280 | 354,710 | 359,210 | 13,829·6 |
| Gannon's Point.. | ,, Red.. .. | 31 | 13 | 44 | 1,840 | 2,980 | 203,530 | 208,350 | 8,209· |
| Blind Neds .. | Friesian Jersey .. | 51 | 11 | 62 | .... | 2,080 | 285,230 | 287,310 | 12,038·3 |
| Riverview .. | Culls from all Farms.. | 38 | 21 | 59 | .... | 2,080 | 223,230 | 225,310 | 8,449·1 |
| | | Total Production of Estate .. .. .. .. | | | | | | 5,682,880 | 217,337·4 |

## THE UNITED STATES OUTLAY ON PROGRESSIVE AGRICULTURE.

DISCUSSION on the financial appropriations for next year was taking place in the Legislature of the United States at Washington when the last advices left, and the *Newsletter* brings to light the estimation in which progressive agriculture is held in that country. The original estimates framed by the Department called for a total of about 37,000,000 dollars for the year 1921, an increase of about 3,628,000 dollars over the appropriations of the previous year. But legislators are the same the world over, and the amount had to be cut down by one item and another, until at the time the latest advices left the total had shrunk to 32,740,000 dollars.

If the New South Wales publicist reflects that that seems a generous sum, let him also take account of the fact that part of these large sums is paid as subsidies to the agricultural colleges situated in each State of the Union, on condition that the colleges spend similar sums out of their own or the State funds on research and extension work. The amount so expended appears to approximate another 4,000,000 dollars annually, and does not include the enormous expenditure of the colleges and experiment stations on purely collegiate and educational work, so that Uncle Sam's total expenditure on the advancement of primary production is a tidy amount, beside which our expenditure in New South Wales is very small indeed.

## AN INQUIRY ABOUT FALSE CASTOR-OIL PLANT (*Datura stramonium*).

As it has been noticed that this plant has been largely stripped of its leaves by stock during the recent drought, the Chief Inspector of Stock would be glad to receive reports from any stockowners who consider that they have lost stock from eating this plant during the dry time. The seeds have often been recorded as poisonous in other countries.

# Suspected Cases of Poisoning of Stock.

## The Correct Material and its Submission for Analysis.

MAX HENRY, M.R.C.V.S., B.V.Sc., Government Veterinary Surgeon, and
E. GRIFFITH, B.Sc., A.I.C., Assistant Chemist.

From time to time material is submitted to the Department for the purpose of analysis in connection with suspected cases of poisoning in stock, and not infrequently the work of the officers who have to make the analysis is hampered or unduly increased by the manner in which this material is forwarded. In such cases the results are unsatisfactory and disappointing to both parties concerned. It is to prevent this, and at the same time to make it more likely that a successful result will be obtained from the analysis, that the following instructions are given.

In the first place all such material should be forwarded to the Chief Inspector of Stock, together with a full report of the circumstances surrounding the mortality. The report should state the class and number of animals dead, condition of the stock and pastures, nature of feed and water supply, any changes in the food, recent history of the stock, symptoms of illness shown if possible, and where a post-mortem examination can be made, the appearances noted.

Any possible complicating factors, such as recent dipping or drenching, poisoning for rabbits and other animals, or the use of sprays for destroying plant parasites or plants should be mentioned, and the name of the medicament or agent used should be given.

A report correctly made on these lines will often give a clue to the probable cause of death, and will certainly enable the veterinary officer and the chemist who have to deal with the matter to exclude many possible causes, and so save much time and work in arriving at a conclusion.

Every effort should be made to see that the material is despatched with as little loss of time as possible and by the quickest route; the fresher it is when received, the more chance there is of a successful examination, especially with volatile poisons such as prussic acid.

The material should be packed in clean, water-tight bottles and jars. No disinfectant should be used, as this introduces foreign substances and may mislead the analyst, and the material should not be placed in water, alcohol, or any other preservatives.

It is better to err on the side of sending too much than too small an amount of material, especially if there is doubt as to the nature of the poison, since it will have to be divided into several portions during analysis.

It should be recognised that different poisons are found deposited in different organs, and are not evenly distributed throughout the body.

The following notes indicate the animals usually affected by different poisons, the means by which they may become affected, and what portions of the body should be submitted for examination when that particular poison is suspected:—

*Arsenic.*—The usual sources of the poison are dips and drenches, but cases of poisoning occur from rat powders, smelting furnaces (from the deposition of arsenic on the pastures round the works), paint, from improper dosage and from malicious poisoning. The animals usually affected are cattle and sheep, but horses, pigs and other animals may suffer at times.

For analysis the organs required are parts of the stomach and intestinal walls (the whole viscera in small animals), portions of the contents of stomach and intestines, liver, spleen, kidneys, and the crop in fowls.

*Antimony.*—Poisoning is usually due in this case to overdosing with condition powders, and the animals usually affected are horses. The material required is the stomach and contents, liver, spleen, and muscle (about a couple of pounds from the thigh and chest).

*Copper.*—As a result of overdosing for worms or from the use of sprays in the orchard, sheep are commonly affected by this poison, but any animal may suffer. The organs required are the stomach and contents, part of intestines and contents, liver, lungs, and kidneys.

*Lead.*—Cattle are most affected by lead poisoning from their habit of licking and eating paint, but the effluvia from lead works by impregnating herbage has been responsible for mortality in various kinds of stock.

For analysis the organs which should preferably be submitted are the liver and kidneys, muscle, and bones. Portion of the contents of the alimentary tract should also be forwarded, and the reticulum in cases of chronic poisoning in ruminants.

*Mercury.*—Poisoning from improper dosage, absorption of mercury from ointments, and uterine irrigation occurs most commonly in cattle, but the vapour from works and mines may render the pastures poisonous. The materials required for analysis are the kidneys, liver, stomach and intestines and part of contents, the crop in birds, and part of the contents of the rumen in cattle.

*Zinc.*—Poisoning from this source is rare, but may happen from accidental administration. The materials required are the fæces, liver, kidney, and spleen.

*Phosphorus.*—A common cause of poisoning, owing to its wide use as a rat and rabbit poison. Portions of the stomach and intestine and their contents should be forwarded with the liver, kidney, heart, and muscles. The gullet and gizzard should be forwarded in the case of birds.

*Sodium Chloride* (common salt).—Usually associated with mortality among pigs and fowls. Portions of the injesta should be submitted, and some of the food last fed to the animals or birds.

*Hydrocyanic Acid.*—Cases of poisoning by hydrocyanic acid (prussic acid) are most commonly due to the consumption by stock of plants which contain the necessary constituents for forming the acid, but it may occur

from careless use of cyanides for poisoning opossums. The material required is the stomach and intestines and contents or portions of them, liver, blood, and muscle. Any suspected plants should also be forwarded in as fresh a state as possible and in fair quantity (1 or 2 lb.).

*Carbolic Acid, &c.*—Cases of poisoning at times occur when this is used as sheep dip or mange dressing, and from accidental administration. For analysis the stomach and intestines and contents, blood, liver, and urine should be submitted.

*Opium and Morphine.*—Most commonly occurs in horses from excessive dosing in cases of colic. The organs required are the stomach, intestines and contents, liver, and urine.

*Strychnine.*—A common cause of poisoning owing to its use as a dog, rabbit, and crow poison; occasional accidents occur from overdosing. The organs required are the stomach and contents, blood, liver, kidneys, and urine.

*Tobacco and Nicotine.*—Poisoning from dips, washes, sprays, and drenching is not uncommon, and is mostly seen in sheep and horses. The stomach and contents, liver, and blood should be submitted.

*Turpentine*—Poisoning by this means occasionally occurs from overdosing and improper administration. Forward the lungs, kidneys, and stomach and contents.

*Unknown Poisons.*—Many cases occur in which, although poison is suspected, the owner is unable to give any indication as to the precise nature of the poison. It is safe to say that very many of these cases are not due to poisoning at all, but it is often necessary, in order to arrive at the cause of death, to eliminate the possibility of at least the commoner poisons being involved.

In these cases portions of the stomach and intestines (together with their contents in large animals and the whole alimentary tract in small animals and birds) should be forwarded, together with the liver, spleen, kidneys, and portion of muscle and urine.

In the case of small animals and birds, the whole carcase should preferably be sent, and the fullest possible history and description of the nature of the symptoms shown. Wherever it is only hand-fed animals that are attacked, samples of the feed should accompany the other material.

## Vegetable Gardening in September.

The Department's pamphlet on vegetable growing for September is now available, and may be obtained free on application to the Under Secretary and Director, Department of Agriculture, Sydney.

The pamphlet tells in a clear direct way exactly how to set about the tasks for the month, and the ground covered in its seven pages is surprisingly extensive. Beside general sowing and planting recommendations for September—the month for main spring sowings—detailed instructions for the raising of tomatoes are given, with numerous other hints, making up a leaflet worth writing for.

# The Control of Cattle Tick.*

## Experiments with Arsenical Dipping Fluids.

L. COHEN, F.C.S.

During the period of thirteen years that has elapsed since the cattle tick (*Margaropus Australis* or *Boophilus Australis*) first made its presence felt in the State of New South Wales, the treatment of infested or suspected stock with arsenical solutions, together with a system of quarantine, has been the method adopted by the Government with a view to the eradication of the pest.

Since the general introduction of arsenical dipping fluids in various parts of the world, it has been observed that the original arsenious oxide in many baths tends to become converted by oxidation into arsenic oxide. This more highly oxidised form of arsenic was understood to have considerably less effect on the tick than in its original condition, but the experiments on the subject cannot be said to have established anything very definite in regard to the relative tick killing power of the several forms.

The principal obstacle in the way of experiments on ticks in New South Wales is the scarcity of tick-infested cattle, but an opportunity arose in the latter part of 1916 of operating on a Queensland herd, the property of Mr. T. Campbell, of Murwillumbah, who was at that time a member of the New South Wales Tick Advisory Board. By the courtesy of this gentleman we were enabled to carry out experiments on his property, "Helen's Vale," Oxenford, South Queensland, in 1916 and 1917, and again in 1920.

The conclusions to be drawn from the results of this series of experiments are :—

1. The Departmental dipping formula contains more arsenic than is required to produce the best results.
2. The Departmental mixture at full arsenical strength has intrinsically no deleterious effect upon cattle, including dairy cows in full milk.
3. Arsenate up to 0·3 per cent. by itself, or up to 0·2 per cent. combined with 0·1 per cent. of arsenite, has no noticeably injurious effect on cattle.
4. Emulsion is not essential to a dip fluid, provided the utmost care is taken to ensure the thorough wetting of every portion of the skin of the beast. As, however, this is impracticable in routine eradication work, the employment of emulsion is desirable for all ordinary purposes.
5. During the second moult, ticks are able to resist successfully the action of arsenical fluids at all commonly employed concentrations.
6. Even at less than half "standard" arsenical strength, the only surviving ticks appear to be those undergoing the second metamorphosis at the time of treatment.
7. Arsenate possesses appreciable tick-killing power, probably about one-third that of arsenite.
8. Arsenical fluids appear to act more rapidly in summer than in winter.
9. In continuous dipping for eradication purposes, treatment in weaker solutions at shorter intervals appears to offer brighter prospects of success than the present method.
10. Cattle leaving quarantine might advantageously receive two dippings with a four-day interval in a 5 lb. solution, instead of with a five to ten-day interval in an 8 lb. solution.

*** Summary of a report made available by Mr. S. T. D. Symons, Chief Inspector of Stock.**

# The Pruning of the Vine.

[Continued from page 126.]

H. E. LAFFER.

## TRELLISED SYSTEMS.

For simplicity of description, the systems of training may be divided into two: those in which the main arms (two or more in number) are placed on either side of the stem—usually termed espaliers or spaliers—and those in which the main arm is placed on one side of the stem only, known as cordons.

In the first instance the arms are trained horizontally upon the wires, right and left of the stem, and in the simplest form there are two arms. In certain cases modifications are adopted, two or more pairs of arms being obtained at different levels. Although such modifications may not, from the theoretical point of view, be the best treatment, in practice they afford a means of overcoming difficulties in handling the accumulations of growth from a strong vine.

The objection raised against the two-armed, or spalier, vine is the possibility of uneven sap distribution, to the ultimate upsetting of the balance between the arms. This applies more to those vines which are trained with long permanent arms than in the simple forms of spaliers, with short and easily renewed main arms. It follows that when one arm, for some reason or other, secures a margin in the vitality of the vine it will naturally use this preponderance of vigour to the detriment of the weaker member. In this way the difference in the vigour of two arms may become more marked, to the ultimate failing of one half of the vine.

When there is but one arm, as with the cordon, it represents but the one main channel for supply of the sap, and therefore any fault in distribution can only affect the secondary arms. It would appear to be more natural to divide the crown of the vine when training and to develop the two-armed type. In addition, this system is more generally known in Australia than the cordon, and it is therefore more generally adopted. Nevertheless, the cordon has many advantages, and where adopted has given excellent results. It applies to best advantage in the case of vines growing upon rich soils, where the nature of the growth enables the main arms of individual vines to meet.

Where trained as a spalier the arms of the vines meet mid-way, while in the cordon the one arm is carried on until it meets the stem of the next vine, or until limited by the strength of the vine.

The same systems of training, both spalier and cordon, are adopted very largely in currant growing. The vigour of the Zante currant under normal

conditions of culture, or under irrigation, makes it imperative that a system allowing of full development of the vine shall be adopted. Thus we find that there is a tendency to resort to double- and treble-decked modifications in order to curb the vigour of this particular vine.

Whether such a practice is the best in the long run is questionable. The simpler the construction of the vine the better the ultimate results, and if this strength of the vine will warrant say 12 feet of main arm well furnished with secondary arms, it is better to have this built up all on the same level than to have the vines half the distance apart with double-decked arms. The only point to be considered is that the one arm may take longer to build up.

The same systems may be applied to strong-growing table grapes in rich soil. It is at times asserted that the long arms have been a failure, but when this has been so it will usually be found that the failure is the result of one of two faults in construction.

Fig. 14.—The Thomery Spalier, spur-pruned.

Firstly, there is a great tendency to extend the arms too quickly from year to year, resulting in an excessive number of buds to be nourished. It then happens that the individual growths from these buds are very weak, or else that a portion of them fail to burst, leaving a poorly-furnished arm. The secret of successful formation lies in the establishment of a stout arm, liberally furnished with strong, vigorous canes to start the secondary arms. None but a strong cane should be used to start a main arm, and it should be so extended that all the buds will give rise to good-sized canes.

The second mistake lies in extending the length of the arm to such a limit that it overtaxes the ability of the root system to nourish the amount of wood and fruit which it is capable of carrying. This is a common trouble in vines of only ordinary vigour. The trouble becomes accentuated when the sun, through lack of foliage, dries up the main arm, interrupting the free flow of the sap. Weak or dead secondary arms ultimately arise, and frequently nature asserts itself in forcing numerous water shoots from the stem or other healthy portions of the vine.

For these conditions modified forms of the systems are used, having, as a rule, short main arms, upon which the fruiting wood is renewed from year to year in the form of spurs and rods.

For general wine-growing conditions, the short-armed types of training are very satisfactory, and they adapt themselves to the majority of the wine varieties of grape. Table grapes, which are generally grown under more favourable conditions of soil and climate, may, by reason of the greater vigour induced, be trained on the more extended forms of spaliers and cordons. The Zante currant is extended similarly, even to the extent of creating more than one set of main arms.

The Sultana vine, on the other hand, in spite of its great vigour, does not respond if the main arms are over-long. The system most usually adopted for this vine is to establish a stout stem, with two short arms of about 15 inches in length, upon which a number of strong fruiting rods are established from year to year, in conjunction with a number of spurs for renewal of wood. Some growers entirely eliminate the arms with the Sultana, and have simply a straight stem, at the summit of which the fruiting rods and spurs are placed. This arrangement would appear to be going to the extreme, but nevertheless, satisfactory results are secured under certain conditions.


Fig. 15.—Note loss of space owing to faulty formation at the crown in A.

### Thomery Spalier System.

This system of training is one well adapted to strong-growing table varieties, or vines growing under irrigation. The typical vine consists of a straight stem which may be of variable height, and which has at the summit of this stem two strong arms extending one on either side of the vine to form as near as possible a perfect T. The length of the arms is adapted to the vigour of the vine and the conditions under which it may be growing. Upon the main arms the secondary arms will be distributed at even distances, and upon these will be placed the fruiting wood. This latter may be in the form of spurs only, or else a combination of spurs and rods.

The use of spurs only will be adapted to table and other varieties which bear satisfactorily from the spur. The present day practice in growing Zante currants is to use the spur rather than the rod, the number of spurs being increased to balance the vigour. When this method is used the spacing of the secondary arms will be much closer than for the spur and rod; roughly speaking, 6 inches apart will suffice, but the actual arrangement rests largely with the man who is pruning the vines.

When the combination of spur and rod becomes necessary by reason of the character of the variety the spacing of the secondary arms will be wider, and here again the ultimate arrangement depends a good deal upon the skill of the pruner. Fig. 14 illustrates this system of training.

*Formation.*—As in other systems, the foundation of the stem and main arms should not be established from weak, spindly canes. Assuming that the young vine as planted into the vineyard is a good, one-year-old rootling, it will be cut hard back to a short spur at time of planting, in order to secure one or more strong canes, and to allow the root system to develop.

At the end of the first year the young vines will, in most cases, be again cut back to a two-bud spur. One of the desirable objects of this system is to ensure that the main arms come from as near the same level as possible, and in order to secure this a certain amount of manipulation of young growth becomes necessary, by which several buds are secured at the same level. From the growth of these buds the arms are established.

An imperfect form of the system is frequently seen when the arms are started from canes with an internode between them. The outcome of this is a more or less pronounced Y below the level of the wire instead of a T, which may ultimately act to the detriment of one or other of the arms. (See Fig. 15.)

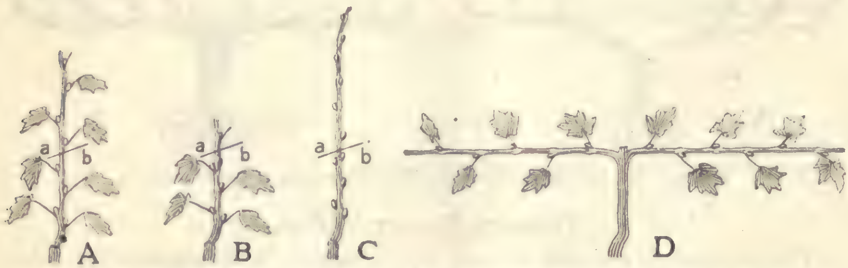



**Fig. 16.—Showing manipulation of young growth to secure buds close together as in C, and the two canes being trained in D to form the main arms.**

The mode of procedure is as follows:—A good strong young cane is trained vertically in the spring, and when it is about three or four internodes above the wire which indicates the height of the stem the tip is broken off above a bud which is just below the wire. In the course of a week or so the terminal bud remaining begins to grow another shoot, and when this is an inch or so in length it is again pinched back. This treatment results in a number of buds being established very much on the same level. The normal growth is now allowed to proceed throughout the growing period.

At the next pruning the stem is tied vertically and firmly to the wire. In the spring two or more canes will start from about the same level, and may be trained on either side along the wire. (See Fig. 16.) These canes should be carefully trained along the wire throughout the season, keeping useless growth thinned out in order to foster the strength of the main canes.

At pruning, in the following winter, the two main canes should be shortened back according to the vigour of the vine. A common mistake of pruners is to make these arms too long in the first year, the effect being to

cause a weakening of the individual canes in the next season, for the reason that there are too many buds to nourish. A further defect frequently results, in that the buds near the base of the arms may fail to burst and those at the extremities become over-strong.

The result to be desired is a strong cane from every bud left upon the arms. In all cases the terminal bud should be left underneath and a full internode should be left for tying to the wire. In general 2 feet to 2 feet 6 inches should be long enough. (See Fig. 17.)

The vine now consists of a T-head forming two arms, and upon each arm several strong canes, with a vigorous one from the terminal bud which is to be used in the extension of the main arm. The vine will now be producing fruit, though it is not wise to allow over-production at this stage with consequent weakening of growth.

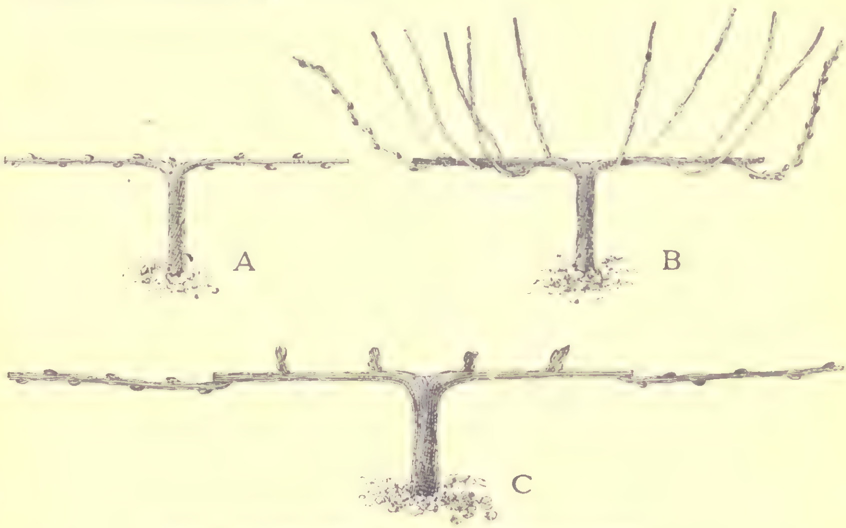



Fig. 17.—Three stages in formation of Thomery Spalier.

The next step is to establish spurs for secondary arms at regular intervals, and the distance of spacing will depend on whether the vine is to be spur or rod pruned in the future. If only spurs are to be established they may be placed approximately 6 inches apart, but if rods are to be employed double that distance will be needed.

Accordingly the lateral canes are utilised to the best advantage, while the terminal ones will be shortened back according to vigour for the extension of the arms, say, to a further 2 feet in strong vines, again leaving the terminal bud underneath.

When establishing the spurs which are to form the secondary arms, it is not advisable to place them too close to the base of the main arm. The general rule is to have the first ones about 9 to 12 inches from the centre of the vine, thereby insuring a more even distribution of the

growth. The tendency is for spurs which are placed closer than this to absorb too much sap and to become over-strong in relation to the growth further along the arm.

The foundation of the vine is now well established, and it is simply a matter of extending the arms from year to year so far as the vigour of the vine will permit. At the next season's pruning the first thing to be done is the renewal of the fruiting wood on the base portion of the arm. If the vine is spur-pruned it is merely a matter of renewing the spurs by reducing the most suitable canes to two-bud spurs. Should the variety be a rod-pruned one the two growths developing from the old spurs will be converted—the lower one into a new spur and the upper into a rod. The latter will, in general, be tied down to the wire by the terminal internode which has been cut through the base of the bud.

The canes on the previous year's extension will be spurred similarly to the preceding portion, thereby establishing a further number of secondary arms. The terminal canes will be used to extend the arms to a greater length.

This process continues until the full extent of the arms has been reached, and finally each arm is terminated by a spur.

*Annual Pruning.*—According as the vine is spur or rod pruned, the annual treatment is on recognised lines. Provided the vigour of the vine is normal there should be no difficulty. The spurs in either case will be selected from such canes as will contribute to the shape of the vine, and at the same time keep the secondary arms as short as possible. The rods, being for purpose of fruiting only, may be placed anywhere, provided that they are fruit-bearing wood.

The ideal arrangement is to form the new spur from the lowest suitable cane, and the rod from the upper, but this cannot always be attained. The spur must have preference over the rod if it is impossible to secure both, and for the time being a rod may be secured, if need be, from a cane on the old rod. All water shoots growing upon the stem or arms should, if possible, be disbudded in the spring, and failing this they must be cleanly cut out at the winter pruning.

As the vine becomes old the secondary arms will probably need renewal by the use of suitable water shoots which may arise from time to time. The vigour of the vine should be maintained, and weakening from over-production should be specially avoided. In the case of rod-pruned vines, where excessive weakness is evident the rods should be dispensed with for one or more seasons, enabling the normal development of wood to be renewed.

### Multiple-armed Spaliers.

The necessity for more than one pair of arms may arise in certain circumstances, and necessarily implies great vigour of growth in the vines. It is confined, for the greater part, to strong vines grown under irrigation, such as the Zante currant, or other strong vines growing under natural rainfall on rich soils.

In the first place a high trellis-work is needed, with wires at heights suited to the scheme to be adopted. The young vine must have a strong start, and a stout cane will be tied vertically to the trellis wires. The principal point to achieve at the outset is the production of a number of strong canes at levels which will coincide with the levels of the wires. It becomes impossible to insure that each pair arises at the same level, and therefore the best possible arrangement must be made.

From the vertical stem the most suitable canes are trained on the various wires, shortening them according to the strength of the vine. In other respects, once the first section is established, extension of the several arms is on lines similar to the Thomery spalier. Greater precautions may have to be observed owing to the multiplicity of arms, and every care must be taken to see that the strength of the vine is not overtaxed.

With regard to the annual pruning, practically the same remarks apply as in the simple spalier type. Indications of permanent weakness in the old vine are remedied by the removal of one or more pairs of the arms.

The main objection to the multiple-arms types of training is that the top arms overshadow the lower ones with possibly some disadvantage to the fruit on the latter. Some of the best currant vineyards on the Murray are single-armed types (spaliers and cordons) and, as mature vines, they are very productive.

(*To be continued.*)

## HAY THAT CONTAINED STINK GRASS (*Eragrostis major* Host).

DURING an investigation by a veterinary officer into mortality among cattle in the Hunter Valley, certain hay came under suspicion. Among other plants the hay contained a grass identified as above by the Government Botanist (Mr. J. H. Maiden), who drew attention to his article on the grass in the *Agricultural Gazette* for July, 1912. The possibility of this grass being involved in the mortality had to be considered, and further inquiry in the neighbourhood revealed the fact that one farmer had been feeding some of his cattle for some weeks on hay made entirely from this grass without ill effects. Although the grass has a very disagreeable odour when fresh, it mostly disappears in the hay. The hay is, perhaps, not of very superior quality, but is not to be despised in carrying stock through a drought period.—S. T. D. SYMONS, M.R.C.V.S.

## THE MEXICAN APPLE.

THE little paragraph on the above subject in the August issue of the *Agricultural Gazette* drew about ten times as many inquiries for plants as the Department could possibly supply. The offer is now withdrawn.

## To Utilise Frosted Maize for Stock-feed.

"We are desirous of stacking for stock feeding through the winter a crop of maize, which had cobs in the milky stage when the whole crop was badly frosted. One stack already in the shed is sweating and heating badly. Any information would be welcomed, whereby the maize could be saved for feeding stock."

The foregoing occurred in a letter addressed by an Inverell correspondent to the Department recently. The Chief Inspector of Agriculture remarked, in reply, that maize that has been frosted should be cut at once, and allowed to cure in the field in stooks of about ten to fifteen bundles for one to two months. The cobs should then be husked from the stalks before stacking.

In this particular case, the farmer should husk out all the cobs from the stalks in the field, cut and tie the stalks into bundles of about twenty stalks, put up the bundles into stooks in the field, and leave them there until dry enough to stack. This would not take more than a few weeks in a dry autumn and winter. In a very wet winter the stalks might never, of course, be fit to bring in, but in such a case they would not be so badly needed as feed.

This method of harvesting maize in the dough stage to obtain both grain and fodder (even when the crop is not frosted) cannot be too strongly urged for the Inverell and Northern Tableland districts, where the autumns are usually dry, and rough winter feed for cattle is often scarce.

Considerable care must be exercised, even after the removal of the cobs, in determining the fitness of the fodder for stacking, in order to avoid heating or spoilage. A mixture of one part of air-slaked lime to three parts of fine salt, distributed as evenly as possible throughout the stack as it is being put up, at the rate of 10 or 15 lb. of the mixture to each ton of fodder, will prevent a certain amount of spoilage without affecting the palatability of the fodder. Practically nothing can be done for fodder when it has actually gone far through heating.

## Protection of Honey-yielding Trees.

The advantage to be gained by apiarists combining in bee-keeping localities to prevent indiscriminate ringbarking on leasehold land and other Crown land is evident. Very commonly it is the best honey trees that are destroyed, while useless timber is left to comply with the conditions imposed by the Lands Department. In several districts where apiarists have combined to protect themselves, application has been made to the Lands Department for preference to honey trees to be ensured on land being thrown open for leasehold, and this has been granted. Sometimes a man has been sent by local apiarists during ringbarking operations to see that the work was carried out according to the conditions. In the first week's operations in one particular area, several leaseholders were reported and subsequently fined. Needless to say, the whole locality benefited by the foresight of the local apiarists. Apiarists should see that good honey trees are protected on all forest areas and reserves. When a number of good trees are left on the land, an improvement for both the grazier and the apiarist is the result. The conditions under which land is to be leased are defined before the land is made available, and bee-keepers and the general public should protect their rights by assisting the Lands Department to see that the conditions are observed, and, if not, that the case is reported, so that the best timber may not be destroyed.—W. A. Goodacre, Senior Apiary Inspector.

# Cotton Growing in New South Wales.

THE high prices ruling as a result of the war have brought this crop into prominence. The industry, which in Australia is largely centred in Queensland, has always had its ups and downs, a renewal of effort on its behalf taking place with an advance in prices, but again declining with a fall.

At the present time there is a serious world shortage of cotton, and prices are up to a higher level than they have ever been; consequently there has been a great incentive to production recently in Queensland, where some cotton has always been grown. The Queensland Department of Agriculture has fostered the industry by supplying seed to growers in that State, and assisting them in the disposal of their crops by making an advance on seed cotton consigned to that Department after deducting the expenses of treatment.

Last season the total amount paid to Queensland growers was over 6d. per lb. for seed cotton, and the Government has now guaranteed to advance to growers in that State 5½d. per lb. upon all seed cotton free from disease and of good quality grown prior to 30th June, 1922, provided that it is consigned to the Department of Agriculture, Brisbane, and delivered at the railway station or port nearest to the place where it was grown. The raw cotton will be subsequently ginned and sold on the owner's account, and, after paying the expenses, the surplus over and above the original 5½d. per lb. will be paid to the supplier of the raw cotton.

The Queensland Department of Agriculture has now consented to extend this favour to New South Wales growers in the northern part of the State, provided a certificate is sent with each consignment that it is from seed supplied by the Queensland Department, and that no cotton grown from other seed is in the immediate neighbourhood.

The Commonwealth Government has also guaranteed a minimum price of 4d. per lb. for raw cotton harvested in Australia during 1920. A promise has also been made to guarantee a minimum price for the 1921 and 1922 crops, but this price has not yet been fixed.

At these prices, the cotton crop must be considered as a profitable side-line on small areas on many farms in the northern part of New South Wales. The districts in which good cotton of the upland varieties has been grown in an experimental way in this State are the North Coast (north of Sydney), and the north-western districts on the main northern and north-western railways, excepting those of the colder Northern Tablelands.

It has been thought that only the tropics are suited to the production of cotton, but in the United States of America (which provides more than two-thirds of the world's total supply) practically none of the cotton-growing area lies within the tropics. In no part of that area are frosts unknown during the winter—in fact, frosts are desirable for the upland varieties, as

they are best treated as an annual crop, and the cleaning and preparation of the land for the next crop is facilitated by frosts, which hasten the wilting and decaying of the plants after harvest.

In America the area sown to cotton on the average farm is under 10 acres. The Queensland Department of Agriculture advises growers that 10 acres is about the limit which one man can tend without outside help at harvesting time, and it is thought that until he becomes efficient in harvesting cotton, about 5 or 6 acres will be sufficient for a grower in this State to undertake at first.

Although yields of over 1,500 or 2,000 lb. of seed cotton per acre have been produced in Queensland, an average yield of 1,000 lb. per acre should be a fair crop. At this figure it is seen that the gross return will be something about £25 per acre. Of this it may be reckoned (assuming that 100 lb. of seed cotton per day can be picked) that about £7 or £8 per acre must be deducted for cost of harvesting.

The varieties most largely grown in southern Queensland are the upland sorts, and it is seed of these varieties that will be most suitable for New South Wales conditions, and which the Queensland Department can supply on application.

Cotton requires a good start and clean cultivation to keep down weeds in the early stages of growth, but once established it can be reckoned as a somewhat drought-resistant crop, at least requiring less rainfall for its subsequent growth than maize. Soils which will grow 40 or more bushels of maize per acre may be relied on to produce a good crop of cotton in normal seasons.

Treating the upland cotton as an annual, which is recognised as the best method in most of the cotton-growing districts on average maize soils, the rows should be about 3 or 3½ feet apart. Owing to some difficulty in obtaining a good stand, it is recommended that on small areas seed should be dropped 5 or 6 inches apart in the rows and later thinned to about 12 or 18 inches, the former distance on the richer soils. This seeding (which can be done with the maize drill) requires 10 to 15 lb. of seed per acre.

The time of sowing should be about the usual time for planting maize, or a little later, to ensure the ground being warmed up sufficiently to induce ready germination. Early in October should be about the most suitable time in most of the districts referred to, but the latter half of September would be quite all right on the North Coast. Planting should be finished by mid-November.

Cultivation should be similar to that for maize, the most important factor being to keep the crop clean and free from weeds in the early stages of growth.

Picking will begin for the early sown crops about February, and will continue until frosts set in. The bolls should be allowed to open fully, and picking should not be commenced in the morning until the dew has completely dried off the plants. The harvesting should not be delayed too

long after the bolls are open, or discoloration from sun and rain will result. For the first few pickings there will hardly be a full day's work on a 5-acre plot, but when the crop is fully productive, an amateur should be able to pick at least 100 lb. per day; smart pickers can get up to 200 lb. or over per day under favourable conditions. With an average yield of 1,000 lb. per acre, and an average picking of 100 lb. per day, a 5-acre field will require about fifty days' picking for one man. With wet days and other work on the farm, this area is suggested as sufficient for one man to look after, unless he can procure other help.

After picking, the cotton should be exposed for a few hours to the sun, in order to remove any excess of moisture.

Compared with maize, it is pointed out that although the cost of harvesting cotton is high, no further treatment is required, while maize, of course, has to be husked and threshed before marketing.

The yield of lint (ginned cotton) is usually about one-third that of the weight of seed cotton harvested.

The value of the cotton-seed after the ginning process is well recognised in America, where the seed is extensively used for the manufacture of cotton-seed oil and of cotton-seed meal, which is largely used as a stock-food.

## BEES SUPERSEDING THEIR QUEENS.

IT was noted by the presence of supersedure queen cells in a hive that a certain colony was about to supersede its queen. To all outward appearances the queen was all right, laying well and keeping up the population of the colony. As she was of pure Italian stock, and it was thought that some other condition not due to the failing of the queen might have been the cause of the bees desiring to supersede, it was decided to give the queen a chance. The queen was removed and introduced to a good, contented colony; within a fortnight supersedure cells were noted there also. For further test the queen was introduced to yet another colony, but within a week, after laying fairly well, she died.

It seems in this peculiar case that although there was no outward sign of the failure of the queen, either the bees or the queen herself must have anticipated the failing. In some cases, especially in accord with the peculiarities of the season, good queens may be superseded, owing, it is believed, to the bees considering the queen not progressive enough in egg laying to suit them. As the work of the queen is a good deal regulated by the condition of the honey flow, weather, &c., the supersedure of a good queen is really due to some peculiarity of the season. A little stimulating feed given regularly at such times when supersedure and balling queens is prevalent is recommended. Above all, do not interfere with the colonies more than is absolutely necessary.—W. A. GOODACRE, Senior Apiary Inspector.

# A Combined Productive and Queen-raising Hive.

W. A. GOODACRE, Senior Apiary Inspector.

EXPERIMENTS have been carried out at the Government Apiary with a "combined" hive that will not alter the system and management of the standard hive for productive purposes, but will yet enable a nucleus hive for queen-raising purposes to be incorporated with it. The hive, as it appears on completion, is shown in Fig. 1. It has been proved in America and in New South Wales that queens can be raised successfully by having nuclei on top of a populous colony, provided they have indirect communication with the colony. In the hive illustrated the nuclei are situated at the rear. Necessary indirect communication is allowed, yet both classes of work—production and queen-raising—can be carried on separately without interruption to either. The communication is allowed through what would, in the ordinary way, be the end-board of a super, but which is replaced in this hive by a hollow division, situated between the super and the projecting part used for queen-raising, and actually forming a passage or ante-room to both. The frames in the queen-raising portion and the super are interchangeable. The success attending the use of the hive has been considered sufficient to warrant its introduction to the practical apiarist, who should find it convenient when wishing to raise a number of queens for his own use, or to start nuclei for increase.

**Fig. 1.—Combined hive as it appears when completed. The projecting portion at the right is used for queen-raising.**

Apart from such work, the hive may be found to simplify the introduction of queens to the parent colony, and tend, too, to minimise swarming. By use of the combined hive, the bees in the super and in the queen-raising portions can be given direct or indirect communication, or completely separated at will. The nucleus colonies receive some benefit even when separated, provided wire cloth is used instead of excluder on the nuclei side, for the bees will receive the heat from the populous colony—an advantage when raising queens or starting up nuclei, as a practical apiarist will understand.

The nuclei colonies are formed in the usual way, and for a start it is advisable to prevent communication with wire cloth as mentioned. In our own experiments the nucleus colony received the desired support from the

populous colony. Work with the nucleus does not to any extent interfere with the populous colony, and all the bees having the same colony odour they can be united at any time. The colonies selected for the combined scheme should be populous. The best time for raising queens is naturally when the colonies are contented and progressive.

### Construction of the Combining Portion.

Figure 2 shows the combining portion of the hive in process of construction; it is half an inch short of being double the length of an ideal super, and its depth may be that of either an ideal super or a half-depth super. The left half of this portion is set in the body of the hive, and forms an ordinary super, and the right half projects as shown in Fig. 1.

The top centre cross-bar is 2 inches deep and $1\frac{1}{4}$ inches wide on its *upper* surface. (The necessity for a slight tapering from upper to under surface will be apparent presently). The upper surface of this cross-bar and the

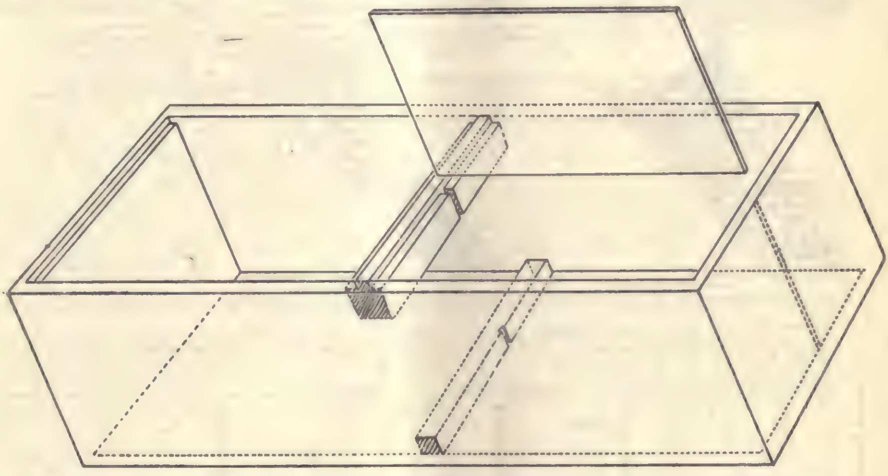


**Fig. 2.—Combining portion of the hive in process of construction, with cross-bars which subsequently form the floor and ceiling of passage between queen-raising portion and hive proper.**

upper edges of both ends of the combining portion are rabbeted to receive the lugs of the frames. When the top cross-bar is nailed in position, it should be possible to put frames in each half of the portion under construction, and the whole should have the appearance of two supers placed end on.

The bottom cross-bar is 1 inch square; it is nailed directly beneath the top cross-bar, and flush with the bottom of the structure. These cross-bars subsequently form the floor and ceiling respectively of the communication passage between the two sections of the combining portion. Dividing the portion to be used for queen-raising is a piece of three-ply wood, which Fig. 2 shows just about to be slipped into the grooves sawn in the end and in the cross-bars.

In Fig. 3 is illustrated the construction of the communication passage mentioned; it presents the opposite view to Fig. 2, the side marked A facing the end of the supplementary portion at the reader's left in Fig. 2. A and B

(B in two parts) are pieces of three-ply wood cut as shown in Fig. 4, and fixed to the bottom cross-bar with leather or metal hinges. As the figure indicates, these sides may be closed and fastened with small metal catches. The necessity for the slight tapering from upper to under surface of the top cross-bar will now be obvious; the lower cross-bar is the narrower of the two, and the tapering of the top cross-bar enables the hinged sides to come flat against it.

Arrived at the stage of construction now pictured, the combining portion only lacks covers and bottom-board for the queen-raising half. Covers in the shape of a piece of board for each compartment may be fixed when the supplementary structure is embodied with the main hive as illustrated in Fig. 1. In making the bottom board for the queen-raising portion, a 1-inch entrance should be allowed in the corners farthest from the main colony. If necessary, this portion may be supported in some way.

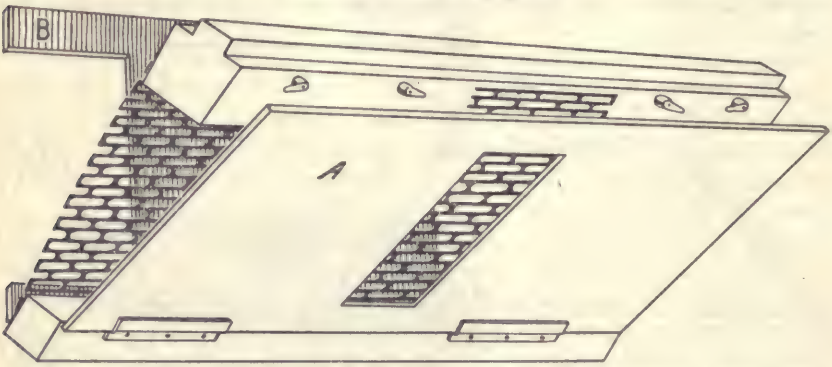



Fig. 3.—Showing construction of communication passage and strips of queen excluder in position.

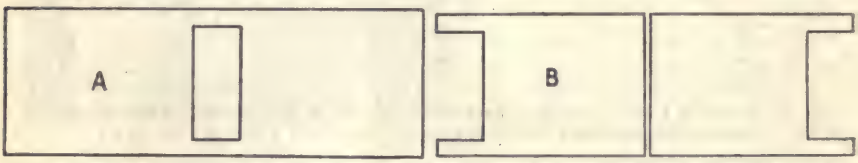



Fig. 4.—Showing method of cutting the hinged pieces of three-ply wood which form the sides of the communication passage.

The nucleus colonies are formed in the usual manner, either from the parent colony or from other colonies; three frames in each nucleus will be sufficient and will give good communication in an eight-frame super. At the beginning it is best to prevent communication. This can be done on the nuclei side, but after the bees settle down to their work the excluder can be exposed and communication given.

I have tried other methods of giving communication, such as by bare double excluders, and the colonies were supported all right and the cells hatched freely, but the bees were very excited and in most cases balled the young queens. Direct communication, so far as our tests when raising young queens indicated, should be avoided.

# Root Rot of Fruit Trees due to *Armillaria mellea.*

W. A. BIRMINGHAM, Biologist's Assistant.

ONE cause of root rot in many fruit trees is the "honey fungus"—*Armillaria mellea.* It is a disease existing without any marked symptoms as far as the top of the tree is concerned, at least until the fungus has obtained such a strong hold on the butt and root-system as to be almost beyond treatment.

This fungus belongs to the botanical family Agaricaceæ, of which the mushroom is a common type. There is probably no fungus more destructive than *Armillaria mellea.* It is found in abundance in Europe and America, and appears to be wide-spread in certain parts of New South Wales.

### The Appearance of Diseased Trees.

In citrus trees the grower's attention is at first drawn to the sickly yellow appearance of the foliage and the dying out of certain branches. When in an advanced stage the trees usually set very heavy crops. If the soil be removed from around the butt and the main roots exposed, trees attacked by the fungus will show a rotten condition of the bark at and below the ground line. The bark can readily be peeled away, exposing the white fungus lying between the bark and wood. Affected roots will show slightly wavy strands, dark brown to black in colour, running along the surface (Fig. 1). These bootlace-like strands, or rhizomorphs, do not become free from the bark as they do in the case of pome and stone fruit trees. They may travel along the roots to the extremities and there reach and attach themselves to the roots of adjacent trees which come in contact with them.

Toadstools may arise at the base of the tree in autumn (Fig. 2), which in form resemble the common mushroom; they are the spore-bearing organs of the fungus. These spore bodies are usually produced in clusters. The cap of the toadstool is from 2 to 6 inches broad, and is borne upon a central stalk 4 to 6 inches long. The stem is yellowish in colour above, but usually brown below, with a more or less persistent collar or annulus. The cap varies from convex to slightly conical. It is yellow to orange-brown in colour, hence the name honey fungus, the centre of the cap when younger being often covered with small brown or sooty scales. On the underside of the cap are white or slightly discoloured gills, distinct from one another and slightly running down the stem.

The growth and effect of the fungus on pome and stone fruit trees is similar to that in citrus trees, with the exception that in the case of the two former, the bootlace or rhizomorph stage is isolated from the bark, and is found running over the surface of the roots (Fig. 3).


**Fig. 1.—Rhizomorphs on Citrus Roots (specimen).**

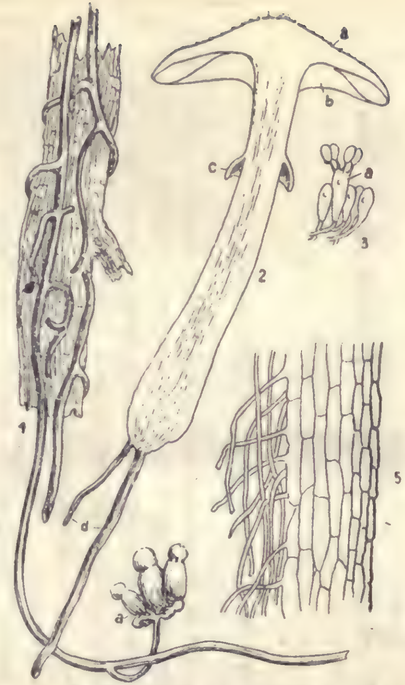


**Fig. 2.—Diagram of Sporophore of** *Armillaria mellea.*

2, section of fungus, *a*, pileus; *b*, gills; *c*, ring; *d*, black, cordlike strands of mycelium; 3, basidium, *a*, accomp nied by paraphyses; 4, portion of tree root with branching strands of mycelium surrounding it; *a*, a cluster of young fungi springing from the myc-lium; 5, section from outside to centre of rhizomorph or black strand of mycelium. Figs. 3 and 5 mag.—*After Massee.*

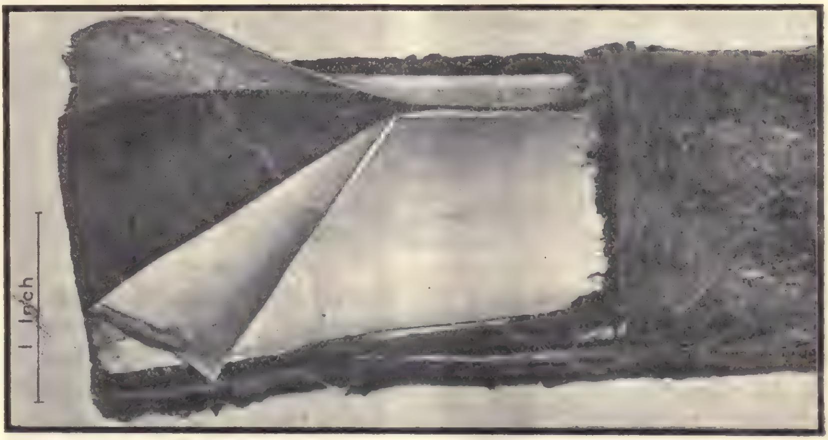



Fig. 4.—Peach Root attacked by *Armillaria mellea* (specimen).


Fig. 8.—Rhizomorphs on Nectarine Bark (specimen).

### How the Disease is Spread.

The means by which the disease spreads are as follows :—

1. The fungus, which is a parasite on native timbers, is left over on stumps and in the soil when the land is cleared for planting, and the young trees are too often planted before the pest has died out.
2. By means of infected roots coming in contact with the extremities of adjacent trees.
3. By means of spores, which are shed from the gills on the underside of the cap of the toadstool or sporophore.

### Effect of the Fungus on the Tree.

The fine fungus threads penetrate the tissues of the root and form a fungal sheet, resembling a sheet of tissue paper, between the wood and the bark (Fig. 4). This robs the root of nourishment, and prevents the rising of nourishment to the stem, the result being that the tree gradually perishes. The cutting off of the sap supply produces a yellowing of the leaves and prevents the manufacture of the food necessary for the maintenance of the tree. The presence of the fungus between the wood and bark also prevents the formation of new wood and bark tissue. In advanced cases the butt of the tree may be ringbarked by the fungus.

### Control Measures.

It is hardly possible to adopt effective control measures, but it is desirable that every means possible be taken to get rid of all stumps and roots before an orchard is set out. In districts where the pest is known to exist, newly cleared land should be sown to some grain or other field crop (with the exception of potatoes, which are susceptible) for several years previous to its use for orchard purposes.

When a tree is found in the early stages of attack, the soil should be removed from the butt and main roots, the diseased bark at the butt removed with a sharp knife, and all diseased roots traced out as far as possible and removed. The cut surfaces should be painted with bluestone paste, made as follows :—

| | |
|---|---|
| Sulphate of copper (bluestone) ... ... | $1\frac{1}{4}$lb. |
| Quicklime... ... ... ... ... | 4 ,, |
| Water ... ... ... ... ... | $1\frac{1}{3}$ gals. |

Dissolve the bluestone in portion of the water and the lime in the remainder, and then mix both together to form the paste.

It is recommended that, when replacing the soil, a fair proportion of the root-system be left uncovered (say one foot from the butt all round) for an indefinite period. All diseased material and toadstools should be burnt.

Where possible the affected trees should be isolated by digging a trench 2 feet deep around them, such trench to be outside the spread of the root-systems. All soil removed in the operation should be thrown on the inside of the quarantined area. Trees found in an advanced stage of the disease should be immediately removed, as they are beyond treatment and are a

source of infection to adjacent trees. When trees are removed they should be burnt on the spot, the soil then turned over and a generous dressing of quicklime provided. The area should be allowed to remain unplanted to fruit trees for a considerable time (several years if possible), and in the meantime the soil should be repeatedly turned over to the action of the sun.

Where trees are slightly attacked, the lower branches should be removed to allow sunlight to reach the butt of the tree. This specially applies to citrus trees, as shade and moisture favour the growth of the fungus. Some growers use a mulch of grass or other material under the trees; this should be kept at least a foot away from the butt. Lack of drainage favours the disease, and where it is defective it should be remedied.

There is evidence that the fungus in some cases works slowly; so that if diseased parts are removed and the tree is kept healthy and vigorous, and is subjected to good cultivation and manuring, it may last for a long time. There is also evidence that the fungus makes rapid progress in wet seasons. This is not so evident in the appearance of the tree as one would expect, but it becomes so if the wet years are followed by drought, when the foliage rapidly becomes yellow and the tree collapses and dies, often just about the time the fruit is ready to pick. Several specifics have been tried out by the Department of Agriculture for the control of this pest, but none of those used has given much promise of success up to the time of writing.

## To Rebuild an Apiary depleted by Drought.

The manner in which a queen bee carries on egg-laying is partly governed by outside conditions, including the supply of honey and pollen that is available for collection by the bees. In the absence of stimulating conditions the queen bee will often cease laying, or perhaps very little brood will be observed. During a dearth of honey in the fields it is a good plan in season to give a little stimulating food daily to maintain progress. The food is given inside the hive by removing the cover and placing a quilt with a hole in the centre over the frames; an empty super is then put on, and the feed (which should consist of sugar and warm water in equal quantities by volume, stirred until the sugar is dissolved) poured into a container which should be accessible to the bees in the empty super. Honey thinned down with water would do for feeding, providing the honey is from a source where it is known there is no disease. Where the number of colonies in an apiary has been depleted by a scarcity of feed, as perhaps happened in a good many places last season, the apiary can be built up again by purchasing a number of untested queens from a queen-raising apiary about the time when the remaining colony or colonies again become populous in the late spring. Nuclei can then be formed for increase, the number of nuclei formed from each hive depending upon the strength to which the parent colony has built up.—W. A. Goodacre, Senior Apiary Inspector.

# Poultry Notes.

## September.

JAMES HADLINGTON, Poultry Expert.

THE hatching season will now be drawing to a close. It will be inadvisable to set more eggs after about the ninth of this month, so that the last chickens will be out on the last day of September. The reason for this cessation in setting has been stated so many times that it seems quite unnecessary to go over that ground again at present. Beginners can accept this advice as absolutely sound—a fact which will be attested to by persons having had experience with late chickens. It is quite understood that concerning this limitation, the question is likely to be asked: Why so precise a termination of the hatching season? The answer is that even a week or two is found to make a very material difference in the results obtained. In this respect the point between raising profitable and unprofitable stock is a fine one—especially when large numbers are involved. For the sake of beginners, it must be reiterated that nothing but disappointment is likely to result from chickens hatched out during the ensuing four months.

### Rearing.

While the hatching will, or should, finish this month, we are still right in the middle of the rearing period. Chickens will be in the brooding stage until early in November, and since September and October are the months when the largest aggregation of chickens will be on the farm, it follows that that is also the time when the maximum troubles will be experienced. It has already been pointed out that disparity between the incubation and brooder capacity is one of the worst evils affecting the hatching season, because it leads to congestion, and this is the forerunner of all sorts of trouble and a serious mortality. The cause of this mortality is not necessarily disease, although disease in an epidemic form is often brought about in this way, the conditions being suitable for the development and propagation of the different organisms that cause disease.

It is well to remember that when rearing chickens we are dealing with very tender life, and that if we cannot save our chickens by preventive means there is little hope of being able to do so by medicine.

What constitutes congestion and overcrowding was dealt with in last month's notes. However, let it not be imagined that space alone will prevent it, because even with unlimited space the conditions may be such as to cause the packing together which is the worst form of crowding. To cite cases, the writer has often seen 200 to 500 chickens, six to eight weeks old, housed in a large shed or hen-house, which, as far as room was concerned, would accommodate double that number. Owing, however, to the tendency of chickens to crowd

together for company and warmth, disasters of the character mentioned above have resulted, while their owners would protest that the chickens had plenty of space. Here, then, is a lesson that must be learnt before successful rearing can result.

The best plan is to house chickens of this tender age in much smaller numbers—fifty to seventy-five is sufficient for one lot—and this applies to the whole growing period until they are removed to the laying quarters, when, say, 5 months old—and even then there is still danger of trouble (particularly from roup) if too many, say 100, are put together at that age. Mature birds are naturally much less susceptible to roup and other diseases of the young, and may be housed in larger mobs if desired. Thin out, spread out, give more space—that should be the motto of poultry-rearers. Only in this way can we prevent the terrific wastage that is the one great cause of failure in poultry-farming on a commercial scale.

### Vermin.

A sharp look-out should be kept for the appearance of vermin, and particularly for head lice on chickens. When the birds are seen to be drooping without apparent cause, a search should be made for these parasites. The slightest touch with salad oil is quite effective to destroy them, but care should be exercised not to smear the chickens elsewhere with oil, as is often done.

Many operators, thinking that the treatment is too mild to be effective, use stronger remedies (such as mercurial ointments), or add kerosene, turpentine, &c., to the salad oil. This is not only unnecessary but dangerous. Chickens are often killed as a result of these departures from the advice herein given.

Another common mistake made by beginners is to spray the brooders and chicken-raising equipment generally with disinfectants as a precautionary measure against disease—a precaution which not infrequently brings about troubles the birds would otherwise escape. There is such a thing as being over-anxious in anticipation of disease. The same thing applies to the use of disinfectants and germicides put in the drinking water. The point is that the operator should be more concerned as to the conditions under which the chickens are being run than with anticipation of disease with which (in all probability) no trouble would be experienced if the conditions were good.

### Meat Meals or Concentrates.

In last month's notes reference was made to the excessive use of meat meals and concentrates. Questions received on this matter appear to indicate that the methods of using these are not yet well understood by many. For the information of such as are in doubt, it might be stated that taking the ordinary foods used for poultry, comprising say, wheat, maize, oats and barley and their meal-products used for the morning mash, together with lucerne with or without a small percentage of some of the oil cakes, examples of which have been given from time to time in these notes and in publications

issued by the Department, about 5 per cent. to 6 per cent. of M.I.B. meal or Compo-meal added to the morning mash only, is required to balance the ration to the desired standard for laying hens. This is, of course, on a standard of 60 per cent., as the protein content of the meal. Excessive amounts are liable to cause more or less looseness of the intestines, and sometimes enteritis. It is therefore advisable that the amount used should be restricted to the quantity mentioned, or at any rate should not be much in excess.

In regard to bone meal, the use of this should be almost confined to chickens, and 3 per cent. to 5 per cent. might be used in *one feed per day* for chickens between 2 and 6 weeks old. After that about 5 per cent. of Compo, which is a mixture of meat and bone meal, might be used in *one mash feed per day*. It might be well to point out too that the idea of feeding chickens on a highly concentrated or narrow ration is not the way to rear strong profitable stock. The objective in feeding the young should be to develop to the fullest extent the capacity of the bird to consume food. The development of such capacity is of utmost importance, and is a prime factor in building up a constitution that will be able to convert the largest amount of food into eggs during the laying period. The small eater is not the bird to stand the strain of high egg-production and of laying good-sized eggs, and at the same time be capable of transmitting a good constitution to its offspring. Not only so, but feeding on a too-concentrated food generally brings on too early maturity with all its train of evils.

## Community Action and Grasshopper Control.

*Conservation* (the monthly journal of the Commission of Conservation, Ottawa, Canada,) in its issue for May cites as an instance of the value of community action in dealing with an insect pest like locusts, an experience of certain Quebec farmers in 1915. About 30,000 acres of growing crop in St. Etienne-de-Gras and adjoining parishes were treated with poisoned bait within a period of two or three days, and, as a result, 95 per cent. of the locusts were killed, and crops were saved in some fields where, owing to continued outbreaks of these insects, nothing of value had been harvested for several years.

## Size of Core and its Significance to Maize Growers.

THE growing of a certain variety of maize because it has a small core—simply because such cobs usually thresh out well—has been overdone by many farmers. Some cores are certainly of excessive size, but it is difficult to understand how a core of moderate size can be regarded as an objection, in view of the fact that the core itself is largely waste, and that such a core usually carries more grain than a small core.

Yield per acre, not percentage of grain per cob, is the most important consideration, and it is the one farmers should keep before them.—H. WENHOLZ, Inspector of Agriculture.

# Orchard Notes.

## SEPTEMBER.

W. J. ALLEN and S. A. HOGG.

### Spraying of Stone Fruits.

As the last few months have been rather wet, there is a chance of an outbreak of curl leaf among peaches. A warning was given last month to spray with lime-sulphur in the dormant stage. Except in very moist climates the same treatment will delay the development of rust and shot-hole fungus to a sufficient extent to render these diseases practically harmless. In localities very near the sea, shot-hole and rust are more difficult to control, and an application of Bordeaux mixture (6–4–50) can be given at the pinking stage.

### Apples and Pears.

As sap is rising early this season in many districts, September will be too late for further plantings.

It will be necessary about the end of this month to spray some of the early blossoming varieties of apples and pears ; as a preventive to black-spot, either lime-sulphur or Bordeaux mixture should be used. Good results have been obtained by using these sprays when the buds are first opening, before the pinking stage is actually reached. We again recommend using departmental formula for lime-sulphur at the pinking stage—1 in 28, and 1 in 34 in the later sprayings. Bordeaux mixture should be used at 6–4–50 strength for the pinking and later stages.

The first spraying for codlin moth must be given about the same time as the second application for black spot—when the petals fall and before the calyx closes.

Recent experiments in the departmental orchards have shown that, though iron sulphide will control mildew of apple, in some seasons it seriously checks the growth of both tree and fruit, and for this reason its use is no longer recommended. Atomic sulphur, on the other hand, has given control, and has not shown any checking influence on trees or fruit. The same experiments have shown that the first application should be made from spur-bursting to pinking period, followed by applications combined with each arsenate of lead spray.

Owing to the absence of outbreaks of black spot of apple, the Department has not been able in these experiments to determine whether atomic sulphur gives any control or not over the latter disease ; experiments are being continued in order to determine this, or whether a combined fungicide can be used to control both these apple diseases. Experiments are also being continued with another precipitated sulphur, which gives promise of being very similar in its action to atomic sulphur, and cheaper to use.

### Grafting and Budding.

Toward the end of the month, and in the beginning of October, the apple and pear trees will be sufficiently forward to permit satisfactory grafting, and those trees which it is intended to re-work to better or more suitable varieties should be cut back and grafted. It is best, when grafting older trees, to leave one limb to take a portion of the sap. The scions for grafting should be heeled into the soil until required.

It is preferable to head stone-fruit trees hard back, and to bud the new growth about December, or earlier if it is forward enough.

### Vines.

The vines having been dressed during the winter months with sulphuric acid and sulphate of iron, as recommended for black spot, should (in districts where black spot is prevalent) be sprayed with Bordeaux mixture (6–4–40) when the early buds are bursting, and again with Bordeaux mixture (6–4–50) when the later buds are bursting. If wet weather prevails a further application of Bordeaux (6–4–50) should be made just before the vines blossom. Later applications must be governed by weather conditions. The vines may be dusted with flowers of sulphur during the early growing period as a check to oïdium. This disease makes its appearance within a few days if favourable weather conditions occur, such as rain during sunshine.

## The Lue Gim Gong Orange.

The variety of orange Lue Gim Gong was the subject of some interest some years ago, it having been claimed that it would hang on the tree for as long as three years without deterioration. To test it, trees were worked to the variety at Yanco Experiment Farm, and the reports now to hand from the Manager, Mr. F. G. Chomley, show that the variety cannot be recommended, the fruit being "raggy" and of inferior quality. It loses its colour and turns green, like Valencia Late. The experience at Yanco also shows that under our conditions it does not fulfil the claim that it will "hang for years without deterioration"—presuming, of course, we have the right variety.—W. J. Allen.

## Squaring a Foundation.

A farmer, who was in difficulties about the squaring of the foundation for a dairy, was advised by the Department's Overseer of Works to nail two battens together in the form of a square, marking 8 feet from the angle on one batten and 6 feet from the angle on the other, and then to brace the two marked points with another batten 10 feet long. Peg out the site with wooden stakes and strain the line on the pegs, testing each angle with the batten square. The method is, of course, a simple application of the old "3—4—5" rule.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*At what time and with what implement do you break down the fallow to provide a surface mulch, and what methods to maintain the mulch do you employ during the summer?*

*Is it your practice to harrow the potato crop before the plants are up, and, if so, why? What influence has it on the stand? Do you harrow the crop after it is up, and with what results? What implements do you find best for after-cultivation?*

*Have you taken into consideration what losses you periodically suffer through dry spells? What steps do you think could be taken to ensure a regular and plentiful supply of feed for your stock at a reasonable cost? Would it be profitable for you to ensile, say,* 100 *tons of greenstuff, and hold it until you required it? The present promises to be a good season. What immediate advantage could you derive from it in this matter?*

*How do Leghorns compare with heavy breeds in respect of the number of chickens that can be reared from a given number of breeding stock in a given time?*

*Is co-operation practicable in the classification of small farmers' wool clips?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.*

### Albury.

A pruning demonstration was given by Mr. H. A. Mills on 8th July at Mr. W. Hanna's orchard.

A demonstration of clearing with explosives was given by Mr. C. E. Burrows on 15th July at Mr. T. Heathwood's block. The demonstration was largely attended and was keenly followed by many returned soldiers who are taking up blocks in the district.

The branch is considering the question of again buying spraying materials in bulk, as it was found that a substantial saving was effected by this method last season.

Arrangements were also made for the staging of an exhibit at the Albury show early in September.

### Bimbaya.

The usual monthly meeting was held on 29th June. It was decided to ask the Department to carry out an analysis of the plant known as the "biddy biddy burr," with a view to ascertaining if it possesses medicinal properties. It was also resolved to form a collection of all the plants and

weeds of the district for the purpose of reference. It was decided to apply to the Fisheries Department for a quantity of trout fry for liberation in the Tantawanglo river, and also to ask kindred associations to co-operate in protecting the fish in the stream.

A paper was read by Mr. John Alcock, chairman, giving an account of a visit to Hawkesbury Agricultural College.

### Castlereagh (via Penrith).

A branch of the Bureau has been formed at this centre, with the following office-bearers:—Chairman, Mr. C. A. Holswich; Treasurer, Mr. A. Lang; Hon. Secretary, Mr. D. Hattersley.

### Cunningar.

Under the auspices of this branch, a pruning demonstration was given by Mr. S. A. Hogg, Assistant Fruit Expert, on 13th July. Twenty members and a number of visitors attended. Some of the trees operated on had been dealt with the previous year, and members were very interested in the progress made.

### Kellyville.

The usual monthly meeting of this branch was held on 12th July, when twenty-four members attended. After the usual business had been disposed of, it was decided to arrange for all the members to visit Hawkesbury Agricultural College during September and October.

### Lidcombe.

On 12th July Mr. E. N. Ward, Superintendent of the Botanic Gardens, delivered a lecture to a good muster of members on the subject, "Shade Trees for Towns and Cities."

#### Shade Trees for Towns and Cities.

Mr. Ward said that the task of planting shade trees is as important as the problem of selecting the species best adapted to soil and climate. Trees should possess certain attributes, chief of which are hardiness and capacity to withstand the environment of city life, such as heat, drought, smoke, and dust.

Trees must have straight stems, and must be symmetrical in growth. Few trees are absolutely free from pests, but some are more immune than others.

Trees that grow open, scraggy heads are unsightly, and are not adequate for shade purposes; on the other hand, a dense shade that wholly excludes sunlight is not desirable, nor is the tree that is continuously shedding its leaves and bark, keeping the sidewalks in an untidy condition.

The street tree must be long-lived—slow-growing varieties are generally more so than the quick-growing sorts. Planting in the streets must be done so that posterity may commend us for our forethought.

The lecturer described various trees, some of which, in his opinion, would be more suitable for parks and cemeteries than for street planting. He advised that when trees are being planted fertilisers should not be used, nor should the planting be in "pot holes," which he described as death-traps. Strips should be dug where the land is not wholly cultivated in order to permit surplus water to escape and give uninterrupted root room.

The soil of Lidcombe requires working, but it would be an error to attempt to lighten it with manures.

For streets he advised planting inside the kerb-line, the trees to be not less than 40 feet apart.

Trees need staking from infancy, protection from straying stock and from vehicular traffic, a first-class spraying outfit, and a caretaker who thoroughly understands his work.

A number of pertinent questions were answered, and a hearty vote of thanks was accorded the lecturer.

A number of visiting members from the newly-formed Auburn branch of the Bureau were cordially welcomed.

A well-attended meeting of this branch was held on 26th July, when it was decided to fall in line with the Miranda branch in its movement to link the various branches of the Bureau together.

An address was given by Mr. J. Peckham on potatoes, after which considerable discussion took place, and a number of questions were asked.

### Lower Portland.

A meeting of this branch was held on 5th July, the attendance being rather small owing to the inclemency of the weather. The schedule of prizes for the annual show to be held in 1921 was revised.

A pruning demonstration was given on 13th July by Mr. Brereton at Lower Portland, about twenty members being present.

A lantern lect re was given by Mr. H. Graham Smith, Apiarist at Hawkesbury Agricultural College, at the monthly meeting on 2nd August.

The lecturer dealt with bees and their management, their utility in connection with fruit-growing, and their value as a side-line for the orchardist. The treatment of honey and beeswax for market was also dealt with.

At the close of the lecture a lengthy discussion took place on various phases of bee-keeping, many questions being asked and answered.

The annual reunion of the members was held on 30th July, but as the night was very wet, only about eighty persons attended, all of whom, however, thoroughly enjoyed the amusement provided.

### March.

At the July meeting of this branch Mr. S. J. Franks read a paper on the manuring of the orchard. He advocated methods that would maintain the fertility of the soil, especially the humus content, stating that where the rainfall was sufficient the growing and ploughing in of green crops, like tares, clover, cowpeas, field peas, &c., were what he favoured. There were many kinds of artificial manures on the market, but none would meet all conditions, and each farmer should conduct a few little experiments for himself. In doing so three rows should be treated with each fertiliser tried, and the results from the middle row accepted as the standard.

### Moss Vale.

A pruning demonstration was given by Mr. H. A. Mills on 9th July at "Hill View," Sutton Forest, about thirty members being present. In spite of the inclement weather much interest was taken in the demonstration, and quite a number of questions were asked and answered.

A lecture on sheep was given by Mr. Hinton, Assistant Sheep and Wool Expert, on 15th July, before an attendance of twenty members.

### Mt. Keira.

The monthly meeting was held on 6th July. After the general business had been disposed of, a discussion took place on the subject of fertilisers, and also as to the suitability of the district for jam making and the establishment of a cannery, especially as regards blackberries, large quantities of which are said to be wasted every year.

At a meeting on 3rd August a lecture was delivered by Mr. R. N. Makin, Inspector of Agriculture, on vegetable-growing, which proved of the greatest benefit to those present. Mr. Makin explained the different methods and experiments that have been carried out by the Department, and also the results of the experiments carried out by himself with different kinds of vegetables.

Many questions were asked, all of which Mr. Makin answered satisfactorily.

**Parkesbourne.**

The annual meeting was held on 7th July, when the following office-bearers were elected:—Chairman, Mr. J. Brown, J.P.; Vice-chairmen, Messrs. C. P. Grunsell, C. Apps and W. H. Weatherstone; Treasurer, Mr. H. Bastin; Hon. Secretary, Mr. S. W. McAlister. The annual report disclosed a very successful year. The branch had a large roll of members. In the district apple competition at Goulburn show the branch gained second prize, and members also competed successfully at Sydney and Gunning shows, their fruit exhibits adding to the attractiveness of that section of those exhibitions. The annual social of the branch will be held shortly.

**Tallawang.**

The monthly meeting of members of this branch was held on 31st July, when there was a fair attendance. A general discussion took place on agricultural matters, and also on matters of local interest.

**Tingha.**

The July meeting was largely attended, and a number of ladies were present.

It was decided to co-operate with the Inverell branch in staging a combined trophy at next Inverell show, sectional committees being formed, and an invitation being forwarded to the secretary of the Inverell branch for one or more members of that branch to attend the next meeting to consider the steps to be taken in that connection.

The schedule for the 1921 show was further considered and completed.

During the afternoon demonstrations in fruit-tree planting and grape-vine pruning were given by members.

A very successful pruning demonstration was conducted by Mr. W. W. Cook, orchardist at Glen Innes Experiment Farm, at Mr. Robillard's orchard and at Mr. W. Ayland's orchard.

**Toronto.**

A meeting was held on 16th July. After the disposal of general business, a lecture on grasses was given by Mr. E. Breakwell, Agrostologist. The attendance numbered about eighty adults and twenty senior schoolboys. Grasses suitable for the district were dealt with, and the address was listened to with much interest.

**Walla Walla.**

A pruning demonstration given by Mr. H. A. Mills, on 7th July, attracted an attendance of about fifty members and others. Very keen interest was taken in the various methods of pruning, and many questions were answered by the inspector.

The annual meeting of members was held on 31st July, when the following officers were elected for the ensuing year:—Chairman, Mr. A. J. Wenke; Vice-chairmen, Messrs. W. Crawford and E. T. Moske; Hon. Secretary, Mr. H. Smith.

### Wentworthville.

On 7th July Mr. Leonard Rumble delivered a lecture on the subject of vegetable-growing. In the course of an address that was full of sound, practical information, Mr. Rumble made the following recommendations :—

#### Vegetable Growing.

The position of the garden should be such that it will get plenty of sunlight all day. Drainage is of great importance. "Work the ground well—dig deep" is a good motto. Keep the beds high and narrow, so that they can be got at from either side ; do not jamb them up against a fence if that can be avoided. When the ground is broken up place little heaps of lime over it, let them slake there for two weeks, then spread the heaps out evenly and dig in.

When using the hose, do not just squirt it over the surface for a few minutes. Remember the root system has to be dealt with. With a ¾-inch hose going, it will take one and a half hours for water to get a foot deep. Mere surface wetting is useless.

Seed-beds should be composed of comparatively poor soil, so that the seedlings can be transplanted into richer soil. Get the best seeds procurable ; poor seeds never produce good results, and only waste time, space, and manure.

Plant onions in March, April and May in drills. Put out when as thick as a pencil, 12 inches apart each way. Leeks are slow growers ; plant them in May and they should be perfect in February. The beds should receive a 4-inch dressing of stable manure.

Sow parsnips from July till April, after the full moon. Set them out in deep soil, 10 inches apart ; let them remain till the following September, and they will grow very large. Sow carrot-seed from July to April, and set out 1 foot apart. Sow beet from July till April ; set out 1 inch apart and in all cases keep weeds down. White turnips should follow potatoes ; plant in February, in rows 18 inches apart and 6 inches between plants.

Sow lettuce at any time in well manured land. Seeds planted in March can be transplanted in April. July and August sowings should not be transplanted. Radishes may be sown at any time. Use them young ; the only variety that grows large without getting tough is Chinese White.

Peas should be in rows running north and south. Sow suitable varieties from 25th April, through May and June. American Wonder is good. The common mistake in growing broad beans is crowding them. They should be 2 feet apart. Sow in April, May and June. When the first beans set pinch out the tops.

Lima beans should not be sown before October nor later than February, to avoid trouble from black aphis. Henderson's Lima is a good variety.

### Wetherill Park.

The annual meeting was held on 14th July, seventeen members being present. Mr. A. Clarke was elected Chairman for the eleventh year in succession ; Mr. Cotter was elected Treasurer, and Mr. A. J. Hodges Hon. Secretary.

A discussion on the results of co-operation took place, and it was decided to ask that Mr. Crane, organising officer, should visit the branch for the purpose of lecturing on co-operation.

Mr. R. N. Makin, Inspector of Agriculture, gave a lecture on vegetable-growing on 14th July to a good muster of farmers, who were very much interested in the subject. Mr. Makin visited several farms, which showed some fine crops of peas and beans.

### Yarramalong.

At a meeting held on 14th July, letters were received from the Post-master-General's Department in regard to telephone lines to Ravensdale and Braithwaites, which in each case was referred to the residents for report.

It was decided to ask the Department of Agriculture for a small quantity of seed of sugar-beet for the purpose of carrying out experiments locally.

# AGRICULTURAL SOCIETIES' SHOWS.

**Secretaries** are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Albury and Border P., A., and H. Society ... ... | A. G. Young ... | Sept. 7, 8, 9 |
| Young P. and A. Association ... ... ... ... | T. A. Tester ... | ,, 7, 8, 9 |
| Cowra P., A., and H. Association ... ... ... | E. P. Todhunter... | ,, 14, 15 |
| Ganmain A. and P. Association ... ... ... | T. S. Henderson... | ,, 14, 15 |
| Cootamundra A., P., H., and I. Association ... ... | N. Gardner ... | ,, 15, 16 |
| Northern A. Society (Singleton) ... ... ... | J. T. McMahon ... | ,, 15, 16, 17 |
| Holbrook P., A., and H. Society ... ... ... | J. S. Stewart ... | ,, 21, 22 |
| Narranderá P. and A. Association ... ... | W. H. Canton ... | ,, 21, 22 |
| West Wyalong and District P., A., H., and I. Assoc. | T. A. Smith ... | ,, 21, 22 |
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| Junee P., A., and I. Association ... ... ... | T. C. Humphreys.. | ,, 28, 29 |
| Murrumburrah P., A., and I. Association ... ... | W. Worner ... | ,, 28, 29 |
| Deniliquin P. and A. Society ... ... ... ... | P. Fagan ... ... | ,, 29 |
| Millthorpe A., H., and P. Association ... ... | C. J. E. Hawken.. | Oct. 27 |
| Lismore A. and I. Society ... ... ... ... | H. Pritchard ... | Nov. 10, 11 |
| Tweed River A. Society ... ... ... ... ... | T. M. Kennedy ... | ,, 24, 25 |

## 1921.

| Society. | Secretary. | Date. |
|---|---|---|
| Albion Park A. and H. Association ... ... ... | H. R. Hobart ... | Jan. 14, 15 |
| Gosford District A. Association ... ... ... | H. G. Parry ... | ,, 21, 22 |
| Kiama A. Society... ... ... ... ... ... | G. A. Somerville... | ,, 25, 26 |
| Wollongong A., H., and I. Association ... ... | W. J. Cochrane ... | Feb. 3, 4, 5 |
| Cobargo A., P., and H. Society ... ... ... | T. Kennelly ... | ,, 9, 10 |
| Shoalhaven A. and H. Association ... ... ... | H. Rauch ... | ,, 9, 10 |
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| Ulladulla A. and H. Association (Milton) ... ... | R. F. Cork ... | ,, 16, 17 |
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| Dapto A. and H. Society ... ... ... ... | F. James ... ... | ,, 18, 19 |
| Yanco Irrigation Area Agricultural Society ... ... | R. Tribe ... ... | ,, 22, 23 |
| Southern New England P. and A. Association (Uralla) | H. W. Vincent ... | ,, 22, 23, 24 |
| Dorrigo and Guy Fawkes A. Association ... ... | A. C. Newman ... | ,, 23, 24 |
| Newcastle A., H., and I. Association ... ... ... | E. J. Dann ... | ,, 24, 25, 26 |
| Nepean District A., H., and I. Society ... ... | C. H. Fulton ... | ,, 25, 26 |
| Manning River A. and H Association ... ... | R. N. Slow ... | Mar. 2, 3 |
| Berrima District A., H., and I. Society (Moss Vale)... | J. W. Kenny ... | ,, 3, 4, 5 |
| Camden A., H., and I. Society ... ... .. ... | A. E. Baldock ... | ,, 3, 4, 5 |
| Bellinger River A. Association ... ... ... ... | J. F. Reynolds ... | ,, 4, 5 |
| Mudgee A., P., H., and I. Association ... ... | E. J. Hannan ... | ,, 8, 9, 10 |
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| Goulburn A., P., and H. Society ... ... ... | F. D. Hay ... | ,, 10, 11, 12 |
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| Macleay A., H., and I. Association (Kempsey) ... | E. Weeks... ... | ,, 16, 17, 18 |
| Royal Agricultural Society of N.S.W. ... ... | H. M. Somer ... | ,, 21 to 30 |
| Clarence P. and A. Society (Grafton) ... ... ... | L. C. Lawson ... | April 13, 14, 15, and 16 |

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*Agricultural Gazette of New South Wales.*

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# Agriculture at Nyngan.

H. J. KELLY, Manager, Cowra Experiment Farm.*

IT is generally accepted that Nyngan is beyond the "safe wheat belt." In fact, the western edge of the area within which wheat-growing is profitable is some 50 miles eastward. For many years past, however, settlers beyond the "safe" line have turned their attention to the growth of wheat crops—principally for hay, and in very many instances splendid yields have been obtained.

But the westerner knows that as sure as night follows day lean years follow good ones. Drought is the spectre most dreaded, and when it does appear in gauntest form, crops fail just as do the natural pastures. The uncertainty of the rainfall makes the growth of crops a hazardous undertaking, and it is considered by many too risky to enter upon. To endeavour to solve many of the problems which confront the dwellers of the far west, and to try to minimise, if not wholly prevent, the severe losses which occur when King Drought stalks the land, the Department of Agriculture started an experiment farm on the west Bogan scrub lands, 17 miles north-east of Coolabah railway station, in the year 1898. There the usual pioneering difficulties were encountered, failures experienced, successes achieved, and many valuable lessons learned.

Numerous experiments were carefully planned and conducted for the purpose of ascertaining the most suitable varieties of wheat for the district, the best cultural methods to adopt for the conservation of moisture, whether fertilisers were necessary, and if so in what quantities, what quantities of seed should be sown per acre, the best rotation to adopt, and many other things relative to the profitable growth of crops.

Owing to the inaccessibility of the farm to the general public and departmental experts, the question of transferring the work undertaken at Coolabah to a more convenient and accessible site in similar country and under similar conditions was considered in 1908, and after careful discussion of the claims of several places, the site of the present Nyngan Experiment Farm was selected as being most suitable, on account of it being typical west Bogan country, and representative of a very large area, which it was intended the farm should serve.

From the results achieved at Coolabah, it was now recognised by the Department that in the west agriculture could only be successfully carried on in conjunction with the pastoral industry. Out of twelve wheat crops planted, eight had given satisfactory yields, three had grown sufficiently to make some return for the outlay involved in their cultivation by grazing them with sheep, and only one (that of 1902) had been an absolute failure. All this gave ground for the belief that it would be profitable for graziers to cultivate a portion of their holdings, if sound principles, which the Department had now some confidence in laying down, were adhered to.

* Formerly Manager, Nyngan Experiment Farm.

No crop was sown at Nyngan farm in the 1910 season, but a commencement was made in 1911, although not under very favourable conditions, as fallowing could not be done to any great extent, owing to delay in the operations of clearing the land.

From that time on, however, fallowing always preceded the wheat crops, and the system known as the three-years' rotation system was carried out as far as practicable. This rotation comprised wheat, fodder crops, and bare fallow in consecutive years.

To give an idea of the results obtained at Nyngan for the years 1911 to 1918 inclusive, a plot in the ploughing experiment may be taken as an example, as it compares more closely with the system advocated at the outset than do plots in other experiments, where standard varieties, seeding, and tillage methods were not always adopted. From this plot, too, the yields given are actual, the produce being weighed when fit to stack. For the period quoted, eight crops were sown; five of these were harvested for hay, one was harvested for grain, and the two remaining crops were fed off with sheep, having failed to make sufficient growth to admit of profitable harvesting with the binder. However, they made some growth, and their value as grazing crops was considerable, and it is estimated that—together with the expense of harvesting saved—they added to the crop that was harvested for grain (which yielded 8⅗ bushels per acre) a value at least equal to one average crop for the period.

The actual yields were :—

YIELDS PER ACRE.

| Year. | | t. c. q. | Year. | | |
|---|---|---|---|---|---|
| 1911 | Hay ... | ... 0 13 1 | 1915 | Grain | ... 8⅗ bushels |
| | | | | | t. c. q. |
| 1912 | ,, ... | ... 1 13 1 | 1916 | Hay ... | ... 2 14 1 |
| 1913 | ,, ... | ... 2 14 0 | 1917 | ,, ... | ... 0 15 3 |
| 1914 | ... | ... Grazed. | 1918 | ... | ... Grazed. |

Average yield per acre, 1 ton 5 cwt. 2 qrs.

The plot chosen to represent the system advocated, the yields of which are given above, was always ploughed with a mouldboard plough 6 inches deep, and received the necessary cultivation to keep it free from weeds and to conserve moisture. Seed was planted at the rate of 27 lb. per acre, a variety of wheat which had proved its suitability to the district being used (with an application of 30 lb. superphosphate per acre) but one which in none of the years gave the highest yield for the experiment of which it formed a part.

The average yield shown cannot be considered as other than satisfactory, as a return of over 1¼ tons of hay per acre per year would show a profit over and above the cost of production. Of course the heavy crops, the results mainly of seasons of bounteous rainfall, affect the average appreciably, but it must be remembered that there are good seasons in the west as well as droughts, and during such good seasons the growth of all vegetation is wonderful. If this is availed of, reserves of fodder can be stored to assist in tiding over lean years; but to be in a position to benefit by years of plenty one must take a risk and plant in all years, for the man who can forecast what any one season is going to bring forth has, unfortunately, yet to be born.

However, during the twenty-two years the Department has been endeavouring to solve the problems of the west much has been learned, and although the cultivation of wheat for grain cannot be recommended, the position for the growth of hay has certainly been made safer by the data supplied from the results of the experiments which have been conducted. Of the many factors which tend to the successful growth of crops the three main ones which are humanly controllable are :—

1. Fallowing and suitable preparation of the land.
2. Suitable varieties.
3. Light seeding.

If these three factors be duly recognised and strictly employed, then the battle against adverse agents is turned in our favour, and success assured in a great measure.

That there will be failures in very dry seasons with the most approved methods is only to be expected, seeing that our safe districts suffer likewise, and unless sufficient moisture falls it is impossible to grow crops, but when rains do come in sufficient quantity it must be our care to conserve them in the soil. This is the art of good farming. The results here quoted show the possibilities of such farming at Nyngan.

In addition to the crops that can be harvested and conserved as fodder in the form of hay or silage, there are also the grazing crops, chief of which up to the present has been rape, and it is worthy of note that only in 1918 was rape an absolute failure. On several occasions it failed to germinate immediately when planted, owing to lack of moisture in the soil, but it eventually did so when sufficient rain came, and in many cases produced heavy crops which made sufficient growth on which to graze as many as ten sheep to the acre for a period of two months.

The value of rape is generally recognised as a rotation crop with wheat, both as a fodder for stock and as a soil renovator in keeping up the humus content of the soil and aerating and sweetening the subsoil by its deep-rooted habit of growth. Its value as fodder is increased by the fact that the expenses of harvesting are unnecessary.

Other fodder crops have been tried, and sorghum and Sudan grass have been fairly successful, but further trials are necessary before their growth can be recommended.

For those who intend to make it their home, the west can be made more secure against droughts by the growth and conservation of fodder as a reserve to carry them through the lean years which periodically occur, and it is more than probable that greater advances will be made in this direction in the future than have been in the past. As one who has been intimately connected with the development of this work since its inception twenty-two years ago, I look forward with confidence to the time when the stout-hearted dwellers of that great expanse of country shall be enabled, by the adoption of scientific methods of agriculture, to withstand to a much greater degree their most formidable enemy.

## Control of Liver Fluke.

The young liver fluke or leech must live a portion of its life in the body of a fresh-water snail before it can attack sheep, cattle, goats and other susceptible stock, says Dr. T. B. Simms, Veterinarian at the Oregon Agricultural College. It may therefore be controlled by the destruction of snails in all standing and running water to which stock has access. Regarding the method of such destruction, says this authority, copper sulphate (bluestone) added to the water in which the snails are living has been found effective, and solutions varying in strength from 1 part bluestone to 500,000 parts of water up to as high as 1 part bluestone to 2,000,000 parts of water have been found to kill all snails in less than forty-eight hours. As the treatment does not destroy the eggs, however, a further treatment must be given when these hatch out after an interval of two or three months. It is remarked that the solution is not injurious to higher plants or domesticated animals, but is possibly injurious to fish; and that the water is not injured for bathing, drinking or irrigation unless the solution is made stronger than 1 to 50,000.

Two methods of treatment are recommended—one for standing and the other for running water. In the former method the average depth of the pond is first determined, and the total amount of water estimated; then sufficient copper sulphate to make a solution of 1 to 1,000,000 is added. One ounce to 1,000 cubic feet of water, or to 7,800 gallons, will do this approximately. If the body of water is small, the copper sulphate may be placed in a sack, and the latter tied to the end of a pole and moved through the water until all the bluestone is dissolved. In larger bodies of water it is a good idea to tie the sack of bluestone to the stern of a boat, rowing the latter around the pond until the contents of the sack are dissolved.

Running water can also be treated, but the method is rather complicated.

## Immature Potato Seed.

Immature potato seed is best described as the potatoes from a late sown crop, which, through being frosted, have not been given time to develop fully, or as those obtained by digging an earlier sown crop before it had ripened off. It is for the former reason that potatoes from the tableland districts are better suited for seed purposes in the coastal areas than the locally grown produce.—A. H. E. McDonald, Chief Inspector of Agriculture.

## Increased Production of Wool per Head of Sheep.

That the pastoral industry in Australia is a live and growing thing, and that a very positive improvement has been effected in the production of wool per head of sheep, the appended figures show:—Whereas in the period 1890–1893 there were 60,000,000 sheep, with an average weight of wool per head of 3 lb. 9 oz., in the period 1900–1903 there averaged 36,000,000 sheep, with a weight of wool per head of 6 lb. 3 oz. Finally, in 1916–19, there averaged 35,000,000 sheep, with a weight of wool per head of 8 lb. 7 oz. This means that in 1918–19, with 25,000,000 less sheep, there were 70,000,000 lb. more wool produced than in 1891.—J. Wrenford Mathews, Sheep and Wool Expert.

# Some Aspects of the Rabbit Problem.

C. J. WOOLLETT, Stock Inspector, Tamworth.

NEARLY everyone who knows anything of the rabbit problem is agreed that the best means of coping with the pest are the use of wire netting, digging out, and destruction of harbour. Regarding wire netting, its cost is now so high that its general use is prohibitive, except to those who are comfortably off. Digging out is expensive, and in many places this work is impracticable. Burning harbour is a satisfactory method, and, generally speaking, is cheap. But the wholesale destruction of fallen timber will bring many landholders face to face with another problem, viz., the supply of firewood for domestic purposes. Therefore this work should be done with discretion.

Granted that the three methods already mentioned are the best, the limitations of their application force many people to resort to two other methods, namely, trapping and poisoning.

In many places there is a very decided objection to trapping, and various reasons have been given. For the purpose of inquiring into the soundness of some of the objections to trapping, I made a number of investigations, and, besides, sent a circular letter to over 400 landholders in this district, asking them to keep records of the sexes of the rabbits trapped or poisoned. It is disappointing to find only a few searchers after truth in a subject that has caused so much discussion and diversity of opinion; comparatively very few bothered to take any interest in the matter. A number of correspondents, however, went to considerable trouble and carefully kept records, while a number replied, giving opinions which were interesting, but of little use for the purpose of my inquiry.

If we are to handle the rabbit problem intelligently, we must approach it with an open mind, and be prepared to abandon preconceived ideas, if evidence is adduced which indicates that conclusions based on wrong premises have been arrived at.

It is frequently stated that trappers catch many more bucks than does, and, therefore, by some theory, it is assumed that it leads to more prolific breeding by the does, as they are not worried by so many males. If the statement was correct that the trappers do catch more males than females, there would be no justification for the assumption that trapping conduces to freer breeding, and, therefore, an increase of the pest. There is no reason, except when the does are breeding, why trappers should try to catch more males than females. The same price is paid for the carcase of a doe as for that of a buck at the freezing works; when trapping is carried on for the skins only, the skins of dry rabbits are the best, but there is little difference between the value of a buck skin and of a dry doe.

When the trapper sets his traps, it is a matter of indifference to him what class of rabbits he catches, and there is no way to set a trap so that it will catch a buck and not a female. With regard to the trapping, fifteen landholders who replied to the circular individually supplied the following figures of the different sexes caught :—

| | Bucks. | Does. | | Bucks. | Does. |
|---|---|---|---|---|---|
| No. 1 | 38 | 41 | No. 10 | 220 | 340 |
| 2 | 263 | 266 | 11 | 424 | 936 |
| 3 | 2,920 | 3,388 | 12 | 54 | 62 |
| 4 | 597 | 492 | 13 | 90 | 94 |
| 5 | 83 | 155 | 14 | 720 | 920 |
| 6 | 148 | 125 | 15 | 719 | 480 |
| 7 | 434 | 376 | | | |
| 8 | 519 | 635 | | 7,284 | 8,386 |
| 9 | 56 | 76 | | | |

These figures were supplied during a time when skins were abnormally high in price, and when rabbits were sought everywhere. The figures show that 15 per cent. more does than bucks were killed. But before skins became so valuable, when rabbits were trapped for the freezing works, I visited various works, and, through the courtesy of the managers, was able to examine rabbits as to sex. The rabbits were taken at random, as the trappers brought them to the works. At the time the records were taken this district was in the throes of a drought, and no doubt the rabbits had to travel long distances for food. Stock were very poor, and large numbers were dying, but the rabbits brought to the works were very fat.

| Date of Examination. | Freezing Works. | Bucks. | Does. |
|---|---|---|---|
| 1919. | | | |
| 28 March ... | Boggabri ... ... | 22 | 46 |
| 4 April ... ... | Quirindi ... ... | 37 | 41 |
| 16 ,, ... ... | Barraba ... ... | 77 | 75 |
| 28 ,, ... ... | Manilla ... ... | 120 | 140 |
| 30 ,, ... ... | Gunnedah... ... | 47 | 55 |
| 16 May ... .. | ,, ... ... | 110 | 130 |
| | | 413 | 487 |

The figures show nearly 15 per cent. more does than bucks, and, although a person could not dogmatise on the count, it supports the statements made many times to me by people engaged in the industry that at certain times, for no apparent reason, you will catch more does than bucks, and, at other times, vice versa.

Some landholders would not object to trappers, so they say, if the trapper would set at the burrows, because then the does would be caught. Six reporters mentioned that they trapped at burrows, and from their results it cannot be stated definitely, as is often done, that a great preponderance in the number of females is then found.

| | Bucks. | Does. | | Bucks. | Does. |
|---|---|---|---|---|---|
| No. 1 | 36 | 30 | No. 5 | 262 | 266 |
| 2 | 424 | 512 | 6 | 28 | 34 |
| 3 | 220 | 340 | | | |
| 4 | 56 | 76 | | 1,026 | 1,267 |

For every dozen does at the burrows, ten bucks were caught. Buck heaps are supposed to be the preserves of the males, but two reporters record 18 and 146 bucks and 23 and 125 does, trapped at these heaps.

If the opposition to trapping was soundly based on the reason that the destruction of bucks ultimately leads to the increase of the pest, then poisoning should not be allowed, because the following figures disclose many more bucks being poisoned than does.

Rabbits poisoned, mostly by strychnine, as reported by landholders :—

| | Bucks. | Does. | | Bucks. | Does. |
|---|---|---|---|---|---|
| No. 1 | 70 | 30 | No. 11 | 1,626 | 421 |
| 2 | 45 | 25 | 12 | 25 | 19 |
| 3 | 1,016 | 1,184 | 13 | 942 | 1,045 |
| 4 | 141 | 168 | 14 | 223 | 106 |
| 5 | 56 | 49 | 15 | 11 | 21 |
| 6 | 30 | 60 | 16 | 30 | 15 |
| 7 | 5,756 | 5,227 | 17 | 73 | 58 |
| 8 | 237 | 267 | 18 | 35 | 24 |
| 9 | 7 | 41 | | | |
| 10 | 106 | 119 | | 10,429 | 8,879 |

It is claimed that where trappers are at work, the rabbits become very wild and are scattered about, but the same thing occurs when the poison cart is used.

Statements are frequently made that trappers let the kittens go. No doubt many do, but the legs are invariably broken when caught in a trap. Many of the young rabbits must die from gangrene, even when only the stump is left. The Government graders at Manilla and Gunnedah informed me that only about one in 2,000 grown rabbits brought to the works were without one leg. With trapping there is little danger to stock, whereas poisoning is often the cause of serious losses. The trapper can work effectively all the year round, whereas for months at a stretch rabbits will not take poison. If the trapper's catch is small, of course, he is not well paid for his labour; but the case of the poisoner is worse, for when the rabbits will not take his baits he not only gets nothing for his labour, but he is also at the loss of the poison, which of late has been very expensive.

Although rabbits are very scarce at the present time, they will assuredly soon again become a menace to the agricultural and pastoral industries, unless the price of skins remains high, and the matter of destruction will then become a live question.

These few notes might prove an incentive for others to keep records and publish them in the interests of landholders. Such information would be particularly valuable to persons administering the Pastures Protection Act, and would serve to break down prejudices that are not founded on fact.

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THE U.S. *Weekly News Letter* relates the case of a dairy farmer whose cream cheques before he started testing his cows amounted to 78 dollars, for the produce of 27 cows. A year later his cheques were 223 dollars for the produce of 28 cows—a pretty good return for the small outlay in time and expense involved in testing and culling the herd.

# Farmers' Experiment Plots.

## Potato Experiments, 1919–20.

### New England District.

H. BARTLETT, Assistant Inspector of Agriculture.

Potato experiments were conducted in the New England district last season with the co-operation of the undermentioned farmers :—

J. F. Chick, Tenterfield.
T. Farlow, Red Range.
J. Piper, junior, Llangothlin.
O. J. Perry, Dumaresq.
L. M. Rixon, Uralla.
G. Neville, Kentucky.
W. H. Lye, Tamworth.
S. Collins, Gunnedah.

The experiments comprised variety trials and manurial trials in the New England district, and variety trials at Tamworth and Gunnedah. The variety trials in the New England district were uniformly fertilised with superphosphate at the rate of 3 cwt. per acre. The variety Manhattan was planted in the manurial trials, with the exception of the plots at Dumaresq and Kentucky, where Queen of the Valley and Coronation were used respectively.

Owing to the dry conditions during the spring, planting was postponed until November and December. It was unfortunate that this delay was necessary, as the seed deteriorated in quality. This, coupled with the fact that the conditions were fairly dry, and that the seed was cut, caused a faulty germination in some of the plots. However, although the rainfall was below the average, sufficient falls were registered at frequent intervals to produce fairly satisfactory crops, excepting at Tamworth and Gunnedah; the Tamworth plot did not yield sufficient to warrant the calculation of the yields, and the Gunnedah plot failed altogether.

In all cases the soil was in a satisfactory condition for planting, and the sets were dropped after the plough. Drills varied from 32 to 36 inches apart, and the sets from 18 to 20 inches apart in the drills. After planting, the plots were harrowed. During growth the soil was kept free from weeds, and the potatoes were hilled.

Factor is one of the most promising varieties, and has done well throughout the district, and at Tenterfield and Llangothlin actually topped all others. It is a white-skinned potato, of medium size, even shape, keeps and cooks well, and is a fairly early variety, suitable for early planting.

### Rainfall.

As the rainfall registered prior to planting greatly influences the yield, records from July, 1919, to June, 1920, are appended :—

| | Tenterfield. | Uralla. | Tamworth. |
|---|---|---|---|
| 1919. | Points. | Points. | Points. |
| July ... ... | 42 | 33 | 50 |
| August ... ... | 84 | 108 | 97 |
| September... ... | 50 | 37 | 66 |
| October ... ... | 115 | 184 | 217 |
| November ... .. | 88 | 160 | 52 |
| December ... ... | 194 | 403 | 251 |
| 1920. | | | |
| January ... ... | 131 | 148 | 274 |
| February ... ... | 122 | 313 | 158 |
| March ... ... | 144 | 145 | ... |
| April ... ... | Nil. | 146 | 158 |
| May ... ... | 92 | 24 | Not recorded |
| June ... ... | 165 | 790 | ,, ,, |
| Total ... ... | 1,227 | 2,491 | 1,323 |

### Results of Potato Variety Trials.

| Variety. | Tenterfield. | | | | Red Range. | | | | Llangothlin. | | | | Uralla. | | | | Dumaresq. | | | | Kentucky. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Queen of the Valley .. | 3 | 12 | 0 | 0 | 6 | 19 | 2 | 24 | 3 | 3 | 3 | 14 | 3 | 14 | 0 | 0 | 4 | 7 | 3 | 27 | 4 | 16 | 1 | 0 |
| Brownell .. .. .. | 3 | 14 | 0 | 0 | 5 | 2 | 2 | 16 | 2 | 17 | 1 | 0 | 3 | 15 | 3 | 12 | 3 | 4 | 0 | 2 | | ...... | | |
| Coronation .. .. | | ...... | | | 7 | 16 | 3 | 4 | 3 | 13 | 0 | 0 | 2 | 19 | 1 | 4 | | ...... | | | 3 | 1 | 1 | 0 |
| Surprise .. .. .. | 3 | 14 | 0 | 0 | 5 | 13 | 1 | 12 | 1 | 18 | 1 | 0 | 3 | 17 | 0 | 8 | 2 | 8 | 1 | 16 | | ...... | | |
| Magnum Bonum.. .. | 3 | 16 | 0 | 0 | 3 | 16 | 3 | 12 | 3 | 9 | 2 | 14 | 3 | 2 | 0 | 16 | 1 | 19 | 1 | 14 | | ...... | | |
| Carman .. .. .. | 3 | 12 | 0 | 0 | 5 | 6 | 0 | 8 | 3 | 2 | 3 | 0 | 2 | 3 | 0 | 16 | 3 | 3 | 0 | 24 | | ...... | | |
| Early Manistee .. .. | 2 | 16 | 0 | 0 | 3 | 5 | 3 | 16 | 2 | 16 | 3 | 0 | 2 | 13 | 0 | 16 | | ...... | | | | ...... | | |
| Manhattan .. .. | 2 | 16 | 0 | 0 | 8 | 7 | 3 | 12 | 2 | 4 | 0 | 0 | 3 | 14 | 3 | 4 | 1 | 16 | 2 | 22 | | ...... | | |
| Factor .. .. .. | 4 | 10 | 0 | 0 | 5 | 13 | 3 | 16 | 3 | 11 | 2 | 0 | 3 | 12 | 1 | 20 | 2 | 18 | 3 | 0 | | ...... | | |
| Sussex .. .. .. | | ...... | | | | ...... | | | | ...... | | | 2 | 2 | 0 | 0 | | ...... | | | | ...... | | |
| Satisfaction .. .. | | ...... | | | | ...... | | | | ...... | | | 2 | 12 | 2 | 8 | 2 | 9 | 2 | 6 | 5 | 0 | 2 | 14 |

### Results of Potato Manurial Trials.

| Fertiliser per acre. | Tenterfield. | | | | Red Range. | | | | Llangothlin. | | | | Uralla. | | | | Dumaresq. | | | | Kentucky. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Superphosphate, 2 cwt. | 3 | 8 | 0 | 0 | | ...... | | | 1 | 13 | 1 | 0 | 3 | 3 | 3 | 12 | 3 | 9 | 2 | 1 | 4 | 15 | 2 | 14 |
| Superphosphate, 3 ,, | 2 | 16 | 0 | 0 | 8 | 7 | 3 | 12 | 2 | 4 | 0 | 0 | 3 | 14 | 3 | 4 | 4 | 7 | 3 | 27 | 5 | 6 | 1 | 7 |
| P5, 2¼ cwt. .. .. | 3 | 0 | 0 | 0 | | ...... | | | 2 | 1 | 2 | 0 | 3 | 4 | 2 | 24 | 3 | 19 | 0 | 12 | 5 | 0 | 3 | 21 |
| No manure .. .. | 2 | 15 | 0 | 0 | 4 | 16 | 1 | 0 | 1 | 14 | 0 | 0 | 1 | 16 | 2 | 16 | 3 | 11 | 1 | 2 | 4 | 5 | 0 | 0 |
| P7, 3 cwt. .. .. .. | 2 | 18 | 0 | 0 | 7 | 16 | 3 | 4 | 2 | 4 | 2 | 0 | 3 | 9 | 0 | 0 | 3 | 2 | 1 | 26 | 5 | 0 | 3 | 21 |
| P8, 3 cwt. .. .. .. | 3 | 2 | 0 | 0 | 8 | 11 | 0 | 8 | 2 | 1 | 1 | 0 | 3 | 5 | 0 | 16 | 4 | 0 | 2 | 14 | 4 | 15 | 2 | 14 |
| Basic superphosphate, 2 cwt... .. .. | 2 | 18 | 0 | 0 | | ...... | | | 1 | 16 | 0 | 0 | 3 | 5 | 2 | 8 | 4 | 2 | 0 | 11 | 4 | 5 | 0 | 0 |

The mixture P7 consists of equal parts of bonedust and superphosphate, and P8 of equal parts of blood and bone and of superphosphate. P5 consists of superphosphate, 4 parts, and sulphate of potash, 1 part.

The approximate cost of the manure mixtures was as follows :—Superphosphate, per ton, £5 5s. ; basic superphosphate, £6 10s. ; P7, £9 10s. ; P8, £10 10s ; P5, £11 10s.

The outstanding feature of these experiments is the increased yield due to the application of artificial fertilisers. In every case the manured plots have shown an increased yield over the unmanured plots. The increase is apparently due to the application of phosphoric acid in the form of superphosphate.

In a normal season, with a satisfactory rainfall, it is more than probable that best results would be obtained by applying a mixture of superphosphate and bonedust in equal proportions (P7 mixture) at the rate of 3 cwt. per acre.

The advisability of applying nitrogenous and potassic fertilisers is not evident, and results to date do not justify the expense of using these manures in the New England district, though, of course, individual farmers may find their land benefit by their use.

Most of the growers in New England will admit that manuring pays, yet how few there are who make use of this knowledge! The advisability of applying artificial fertilisers has passed the speculative stage; it has been demonstrated in every part of the State, even on the rich soils of the North Coast. One grower, who has the pick of the rich red soil at Guyra, has manured his potato crop for a number of years past, and this year he has already spent several hundreds of pounds in purchasing fertilisers for next season's planting. His neighbours are following his example. Farmers should ask themselves, if manuring pays, why plant without manure?

## Compressed Fodder.

A recent inquiry from Western Australia on the subject of compressed fodder led to information being collected on the subject. It was ascertained that a fairly extensive trade is at present being done by Victorian firms with Java, Singapore, and other eastern parts. The fodder as made up there is composed of mixed wheaten or oaten chaff with a good percentage of grain and lucerne chaff; a little bran is added to improve the appearance and quality of the fodder. It is made up in bundles running 70 to 80 lb. in weight, approximately 18 inches long, 15 inches wide, and 12 inches deep, and at each end are placed two half-inch hardwood battens about 15 inches long and 6 inches wide, and covering consequently the whole of the two ends. Each bundle is secured with three No. 8 wires, and with the ordinary bundle there is a loss by shedding, as the pressure alone is relied on to keep the bundle together. A hessian cover may be applied to the bundle in the press at an additional cost of about 7s. 6d. per ton. The cost of pressing the fodder, over and above the cost of the ingredients, is about 30s. per ton. The machine used is very similar in action to a power straw press set on end, and the chaff is fed to an overhead hopper by an ordinary belt box conveyor, and falls down into the machine by gravity. Two men operate the compressor, and they put through about 1 ton an hour, and a little less when the fodder is covered with the hessian. The machines used are made by two different firms and cost from £2,300 to £2,600. They are driven by hydraulic power. In some places, with an ordinary press three full bags of chaff are being compressed into a little more than the size of one, and they are secured with two battens at each end, and two wires.

# Roscommon Sheep in Crossbreeding Trials.

F. B. HINTON, Sheep and Wool Instructor.

It is the practice of the Department to test the utility of the various British breeds for crossbreeding purposes, and in accordance with this policy trials with a Roscommon ram were commenced at Wagga Experiment Farm in 1918. Border Leicesters, which have proved so serviceable for crossbreeding for a number of years, were used as a basis of comparison.

The Roscommon as a breed originated in an Irish county in Connaught, and appears to be one of the oldest known breeds in the British Isles. Culley in his book "Observations on Livestock," in 1801, described the breed as being the worst type of sheep he has ever seen. He states :—"It seems to me that the breeders of the Roscommon have set out with the object of obtaining all those points in a sheep which are undesirable." Professor Low in his "Domesticated Animals of the British Isles," however, refers to the improvement of the breed by crossing with the Border Leicester.

In appearance the Roscommon is a tall, gaunt, unattractive animal—rather heavier than the Lincoln, but with a less compact and less shapely frame. The face and points are white and the skin pink, while the wool is of a demi-lustrous type, approximating in spinning quality to the Border Leicester and Romney Marsh, but not as attractive as either.

Quite an amount of criticism was levelled at the Department for using a ram of such ungainly appearance, but as the donor of the ram (Mr. W. W. Killen) stated that the animal was a fair representative of the breed, the trial was proceeded with.

The following table shows the number of ewes mated and the lambs marked :—

| Cross. | Ewes mated. | Mating period. | Lambs. | | Total marked. | Per cent. marked. |
|---|---|---|---|---|---|---|
| | | | Ewes. | Wethers. | | |
| | | days. | | | | |
| Roscommon x Merino ... ... | 25 | 87 | 5 | 8 | 13 | 52 |
| Border Leicester x Merino .. | 25 | 90 | 9 | 12 | 21 | 84 |

The lambs were weighed four times during a period of five months and the average weight at each weighing is presented in the following table :—

| Breed. | Sex. | Weighings. | | | |
|---|---|---|---|---|---|
| | | First. | Second. | Third | Fourth. |
| | | lb. | lb. | lb. | lb. |
| Roscommon x Merino ... ... | Wethers ... | 23 | 36 | 53·2 | 62·4 |
| | Ewes ... ... | 20·5 | 32·5 | 53·2 | 61·5 |
| Border Leicester x Merino ... | Wethers .. | 23·6 | 35·3 | 50·1 | 60·6 |
| | Ewes ... ... | 23·8 | 36 | 53·1 | 59·9 |

The weights were again taken and the sheep measured when the animals were 16 months old (two tooth). The averages are shown in the following table:—

| Breed. | Weight. | | Length. | Waist. | Girth. |
|---|---|---|---|---|---|
| | Body. | Fleece. | | | |
| | lb. | lb. | inches. | inches. | inches. |
| Roscommon x Merino ... ... | $90\frac{3}{4}$ | $6\frac{1}{4}$ | 40 | 35 | 35 |
| Border Leicester x Merino ... | $83\frac{1}{2}$ | $6\frac{3}{4}$ | 38 | $36\frac{1}{2}$ | 33 |

The sheep comprising the test were sold in Wagga in November, 1919, and both crosses realised 22s. 6d. per head.

The results obtained are in no way conclusive, the test covering only one season, and only one ram being used; but perhaps some idea of the relative value of the Roscommon is afforded.

## THE AMERICAN AND THE CORN BORER.

REFERRING to the European corn borer's appearance in portions of the United States, the Florida Plant Board's *Quarterly Bulletin* makes the following statement:—"Already the States of Massachusetts and New York have each expended nearly 100,000 dollars in fighting it, and the United States Department of Agriculture is using a Congressional appropriation of 250,000 dollars for the same purpose, appropriated by Congress in August, 1919. The Department is asking for an additional appropriation of 500,000 dollars, and a conference of State Commissioners of Agriculture and official entomologists, held at Albany, N.Y., and Boston, Mass., on 28th and 29th August (1919), has recommended to Congress that 2,000,000 dollars be appropriated at once to combat the pest, with the additional appropriation, later, of as many more millions of dollars as may be necessary."

The American knows the value of pest control. His maize crop runs annually about 2,500,000,000 bushels, averaging $23\frac{1}{2}$ bushels per acre, and evidently he has no intention of allowing the European intruder to get his crop or even skim the cream off the profits.

## THE HOME-MAKER AND THE RURAL PROBLEM.

THE loss to family and community by the waste of woman's energy . . . . could be prevented by a reasonable amount of planning and well-directed investment in modern equipment. There is much talk nowadays of the economic importance of a contented rural population willing to stay on the land and help to build it up. Perhaps the greatest factor in bringing this about will be the healthy, alert and expert home-maker, who will see to it that a part of the increased income from the farm is directed toward the improvement of the home as a means of contentment and stimuli for farm work.—U.S. *Weekly News Letter*.

# Breeding Cereals at the Experiment Farms.

J. T. PRIDHAM, Plant Breeder.

THE extent of the Department's activities in the crossbreeding of cereals may be indicated by a brief reference to what is being done at the various experiment farms in the present season.

At Cowra, which is the chief station of the State, and particularly representative of the Central-western Slopes, variety tests were sown in triplicate this season of all wheats, oats, and barleys that were grown the previous year and appeared at all promising. Single-row plots were sown of those sorts which are untested or apparently unsuitable, the tests being continued for three years. Varieties which prove suitable in the triplicate section are grown in multiplying plots for more extended trial. About 260 varieties of wheat and 160 crossbreds were sown, 71 varieties of oats and 14 different crossbreds, 38 barley varieties and 4 crossbreds. The number of plots occupied by wheat variations selected from standard varieties total about 250; oat variations 203; barley variations or sports 29. The general length of the row-plots runs from 15 to 50 links, single grains being sown by hand about 4 inches apart. Plots devoted to selections from artificial crossbreds number about 700 in wheat, 79 in oats and 45 in barleys. Imported cereals and samples sent for identification are also being grown, and two varieties of rye. Some imported and crossbred strains of field peas are also being bred, mainly for fodder purposes. Variations from cereals in cultivation are becoming a more prominent feature, presenting a wide field for selection, as natural crosses are from time to time discovered.

At Wagga the conditions are those of the South-western Slopes and Riverina. The tests are on the same lines as at Cowra. The number of wheat varieties growing this season is 90, of oats 23, and of barleys 23. The wheat crossbreds occupy 290 plots, this farm being largely representative of the wheat belt.

Bathurst is typical of the Central Tableland. The number of wheat varieties growing here is 160; it includes a good many imported kinds from cold countries not adapted for the Wagga climate. Wheat crossbreds occupy 127 plots—considerably fewer than at Wagga. Oats are largely grown, 68 varieties having been planted; there are also 37 different barleys, besides crossbreds.

Glen Innes Farm, which is situated in the Northern Tableland, is growing 89 varieties of wheat in the experiment breeding plots, including a few field selections. The oat varieties total 75, with 28 plots of crossbreds; 10 varieties of barley, and 10 of rye were also sown. To wheat crossbreds 65 plots are devoted.

The climate at Hawkesbury Agricultural College is that of the central coastal districts, rust resistance being of prime importance. Some 48 varieties of wheat, 17 of oats, 16 barleys and 7 ryes were sown in triplicate, and wheat crossbreds occupy 63 plots.

At Nyngan, representing the Western Plains, where a hay crop only is looked for in average seasons, only very early maturing sorts are grown, and 20 varieties of wheat, 5 of oats, and 11 of barleys were sown. Six plots of each variety were planted at intervals, as the soil is of a very patchy character.

Grafton is typical of the North Coast district, the plots being situated on alluvial soil; 42 varieties of wheat, 19 crossbred wheat strains, 13 oats, 12 barleys, and 8 ryes were sown in triplicate for fodder purposes. It is proposed to go in more extensively for early oat varieties here.

At Yanco a trial of 25 varieties of barley was sown for fodder and grain under irrigation.

The foregoing do not include the larger plots intended to supply pure pedigreed seed of varieties raised for sale to farmers and for commercial sowings. In the principal departmental farms this has been going on for many years, the seed distributed being not only pure and graded, but of high productivity and vitality, as a result of the careful pedigree selection practised.

## More Imported Rubbish.

A remarkable example of the unscrupulousness of certain seed merchants has just come to light in the examination of a consignment of seed from New Zealand, imported under the Federal quarantine regulations. The consignment was labelled "mixed grass seed," whereas the proportion of true grasses was approximately 5 per cent. About 75 per cent. consisted of *Plantago lanceolata* (lamb's tongue), 8 per cent. of clover seeds, and about 12 per cent. of a mixture of such bad weed seeds that any paddock would certainly be ruined were this "mixed grass seed" sown in the condition in which it was imported.

The number of weed seeds in a pound of this mixture is almost staggering. There were present 33,504 sorrel seeds (*Rumex acetosella*), 192 *Scirpus lacustris*, 256 wire weed (*Polygonum aviculare*), 2,944 docks, 96 thistle (*Carduus lanceolatus*), 64 self-heal (*Prunella vulgaris*), 96 cat's ear (*Hypochœris radicata*), 32 wild geranium (*Geranium dissectum*), and 736 *Ammi visnaga*.

The number of lamb's tongue seeds (*Plantago lanceolata*) in a pound of the seed would probably run into six figures, but at present some farmers buy this seed for pasture, although not recommended by the Department. There was also present a considerable amount of ergot—a very bad fungus.

The Commonwealth Government has power to suppress the importation of such seed, unless it can be satisfactorily cleaned, but no State legislation whatever exists to prevent the sale of such seed to farmers, once it arrives at the merchant's warehouse.—E. Breakwell, Agrostologist.

# Top-dressing Lucerne with Superphosphate.

## FIELD EXPERIMENTS AT YANCO.

E. B. FURBY, Experimentalist.

[The Experiment Supervision Committee wishes to point out that the following are the results from the first year's trial only, but in view of the successful use of superphosphate as a top-dressing on lucerne in other districts it has been thought advisable to publish the report.]

THIS experiment was set out on the following plan, and the applications of superphosphate were made accordingly :—

| | |
|---|---|
| Plot 1 ... (*Check*) | Cultivated but not manured. |
| ,, 2 and 3 ... | 1 cwt. superphosphate per acre applied in the spring (8th September, 1919). |
| ,, 4 ... ... | No cultivation and not manured. |
| ,, 5 ... (*Check*) | Cultivated but not manured. |
| ,, 6 and 7 ... | 2 cwt. superphosphate per acre applied in the spring (8th September, 1919). |
| ,, 8 ... (*Check*) | Cultivated but not manured. |
| ,, 9 and 10 ... | 1 cwt. superphosphate per acre applied in the autumn (13th June, 1919). |
| ,, 11 ... (*Check*) | Cultivated but not manured. |
| ,, 12 and 14 ... | 2 cwt. superphosphate per acre applied in the autumn (13th June, 1919). |
| ,, 13 .. ... | No cultivation and no manure. |
| ,, 15 ... (*Check*) | Cultivated but not manured. |

The plots each comprised $\frac{1}{3}$ acre. With the exception of Nos. 4 and 13, all were cultivated as deeply as possible in June, as soon as it was practicable to get on the land after the last cut had been removed, the autumn application of manure then being applied. No further cultivation was given prior to the spring dressing, which was applied early in September, just as the lucerne was making a fresh start to grow.

As there was practically no rain in the winter in any quantity, the full benefits of autumn manuring were not fully realised, for the little rain there was did not penetrate to the subsoil, and it was not until artificial watering was commenced in the spring that the ground was thoroughly saturated and the manure made available for plant use. Concerning the spring dressings, no indications were noticed on any of the plots to show that the manure from these had been washed to the lowest end of the plots to cause a better growth there. Any extra vigorous growth in the paddock occurs in isolated places on treated and untreated plots alike, and cannot therefore be attributed to the effects of the superphosphate.

Since the autumn dressing was made on 13th June only 345 points of rain have been recorded, while altogether eleven irrigations have been made—on the following dates:—23rd July, 3rd September, 25th October, 25th November, 9th December, 18th December, 10th January, 19th January, 6th February, 26th February, and 8th March. Very hot, windy weather has prevailed throughout the season until latterly, when a cool change occurred, with a coinciding diminution in the rapidity of the growth of the lucerne.

At that period during the hot weather when the crop was making its quickest and most vigorous growth, there was practically no difference observable in the appearance of individual plots, with perhaps the exception of plots 6 and 7, which showed only a slight increase in height and a slightly darker colour than the others.

Six cuts of hay were obtained. The following table illustrates the monetary value of the increase in yield per acre of lucerne hay as the result of top-dressing, the average price of lucerne hay being taken as £12 per ton, superphosphate as £6 per ton landed at Yanco, and the cost of cultivation at 12s. 6d. per acre. This last figure is based on the time it actually took to cultivate and top-dress a 6-acre paddock. The work was done in one day with one man on a six-horse cultivator, and one man on three-horse drill. Men's labour was reckoned at 13s. 6d. per day, horse labour at 5s. (a drought estimate), and depreciation of machinery at 6d. per acre.

TABLE showing Monetary Value of Increase in yield from Top-dressing.

| Methods of treatment in order of merit. | Yield per acre, based on percentage yield. | Increase per acre, due to treatment. | Value of increase per acre. | Cost of increase per acre | Net gain per acre. |
|---|---|---|---|---|---|
| | t. c. q. lb. | c. q. lb. | £ s. d. | | £ s d. |
| 2 cwt. superphosphate applied in the spring. | 3 8 0 10 | 14 0 18 | 8 9 11 | Superphosphate, 12s.; cultivation, 12s. 6d. | 7 5 5 |
| *No cultivation and no manure .. | 3 1 3 11 | 8 3 7 | 5 5 9 | ........ | 5 5 9 |
| 1 cwt. superphosphate applied in the spring. | 3 2 1 15 | 9 1 11 | 5 12 2 | Superphosphate, 6s.; cultivation, 12s. 6d. | 4 13 8 |
| 2 cwt. superphosphate applied in the autumn. | 3 1 2 0 | 8 1 6 | 4 19 8 | Superphosphate, 12s.; cultivation, 12s. 6d. | 3 15 2 |
| 1 cwt. superphosphate applied in the autumn. | 2 16 0 1 | 2 3 25 | 1 15 8 | Superphosphate, 6s.; cultivation, 12s. 6d. | 0 17 2 |
| Cultivated but not manured .. | 2 13 0 4 | ...... | ...... | ........ | .... |

* An irregularity due to difficulty in regulating the exact amount of water applied to each plot evidently occurred here.

From the foregoing table, when the results from light top-dressings are compared with those obtained on the unmanured and uncultivated plot, the conclusion might be drawn that unless lucerne is heavily top-dressed (at 2 cwt. per acre) it is more profitable to leave top-dressing alone. Discarding this plot, the yield from which is at variance with the general results, cultivating and top-dressing lucerne with superphosphate has proved to be quite a profitable practice.

## STANDARDISATION IN AGRICULTURAL MACHINERY.

THE importance of standardisation in agricultural machinery and implements was urged by a number of witnesses who gave evidence before a departmental committee on agricultural machinery, Ministry of Agriculture, London. Says the *Journal of the Ministry of Agriculture* :—"It was agreed that a reduction in the diversity of parts and their interchangeability between implements of the same type are much to be desired. The present bewildering variety of ploughs, for example, produced by individual makers, all in turn differing from those of other manufacturers, and with relatively few fittings common to any of them, increases the difficulties of the users and must necessarily add to the cost of production. . . . . Ploughs and other implements of cultivation appear to afford considerable possibilities of standardisation."

# Cuzco Maize.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

Not all varieties of maize introduced into the State for trial prove successful, and, with the yearly introduction of new varieties from different parts of the world, it is inevitable that some should be found which do not suit any of our conditions, and which, after trial, have to be discarded. A variety known as Cuzco, seed of which was obtained from Chili by Mr. J. M. Paxton, of the Sydney Chamber of Commerce, in 1918, has to suffer this fate.

This maize belongs to the soft, or flour corn family, and similar types are used by the natives of South America and South Africa for human food. They are popular with these people on account of the ease of grinding, owing to the entire absence of horny endosperm. A similar type (Brazilian flour corn), but with much smaller grain, is grown a little in some localities in Queensland, where it is ground into calf meal. Though of some use in this way its feeding value is low, as it consists most largely of carbohydrates (starch) and contains but little protein. The soft nature of the grain renders it easily susceptible to damage by weevil and grain moth, and the grain does not keep well in warm climates. On account of the very late maturity of Cuzco a long growing season is required for it, and it is probably only on our North Coast that it would have a chance of maturing. The trouble experienced there with weevil, however, militates to a large extent against its success in that district. This maize is the giant of the maize family, having grains twice as large as a good sample of Hickory King.

The experience with Cuzco maize in this State has been as follows :—

At Casino, in 1918, it was sown in December, with several other varieties for comparison, and from one-tenth acre plot only a few pounds of grain were produced, most of which moulded on the cob as the result of late autumn rains. None of the ears measured more than 2 or 3 inches in length, and even then many had no grain at all, while on others only a sprinkling of grain set after fertilisation. The leaves were still green and the grain quite soft at the end of May—after six months' growth. It was observed that on most plants the silks did not develop until six weeks after the tassels appeared, a fact which would be responsible for the poor setting of grain. There was also a bad tendency to the formation of two or three cobs at a single node, which in any variety generally results in a bunch of barren ears. The stalks attained a height of 8 feet, and the variety could not compare with any others in the test, either for grain or fodder.

Mr. J. M. Pitt, Inspector of Agriculture on the lower North Coast, reported that in a trial of Cuzco on the Manning River the germination after heavy rain did not exceed 10 per cent. Though the growth attained a height of 10 feet the stalks were still green after six months, and the delay

in silking after tasselling was very marked. Very few cobs formed, and very little grain set even on these cobs : the variety had nothing to commend it.

Mr. R. W. McDiarmid, Inspector of Agriculture in the north-west, reported that at Mount Russell the germination was good, but that the crop died off during the drought.

Mr. G. G. Potts, then Inspector of Agriculture on the Murrumbidgee Irrigation Area, reported in 1919 that Cuzco seed germinated only 60 per cent. and grew to a height of 9 or 10 feet, with no suckering and coarse stems. Owing to the delay in silking, little or no grain formed.

Mr. W. D. Kerle, Inspector of Agriculture on the North Coast, stated that at Bonville only 10 per cent. of the seed germinated. The crop was a poor one and no seed was obtained.

The poor germination in these cases might be expected from such a soft grain if wet weather follows planting. The large amount of soft starch in the grain readily induces rotting under these conditions, especially if the weather is cold.

A communication from a correspondent in Valparaiso, was received by Mr. Paxton, after these trials. It reads as follows :—" In Chili we have not been able, as a rule, to get any results beyond a splendid plant of gigantic growth for ensilage. Cattle eat it most readily. Occasionally cobs form of very large size, but they are not as a rule well-grained. Cuzco stands at an altitude of between 12,000 to 13,000 feet. It is extremely hot in summer and cold in winter, and it would seem that this particular maize can best be cultivated under such circumstances as obtain there."

It appears that even in Chili this maize has not met with much success outside the Cuzco valley, where the conditions are peculiarly suited to it. In order to obtain some information as to whether it is grown in North America, and as to what conditions in South America suit it best, the United States Department of Agriculture was requested to give us the benefit of their experience with Cuzco maize. Their reply was that " this type of maize forms the principal crop in Peru at elevations of 8,000 to 11,000 feet, but as far as known it is not grown in Mexico. In U.S.A. we have been able to mature a crop only on the Pacific Coast, in the cool region round San Diego. Although the elevation at San Diego is low, the climatic conditions are not dissimilar from those of its native habitat. The best suggestion as to the climatic conditions suitable for this variety is a location where there is a frostless period of eight to ten months, with a relatively low air temperature and a high humidity."

It will be seen that these conditions hardly obtain anywhere in this State, and although the variety has made a good growth for fodder in some parts, the difficulty of raising seed is a very serious drawback. Owing to the very large size of the seed, also, about 40 to 50 pounds of seed per acre would be required for a fodder crop—about twice or three times the quantity required of varieties which are highly satisfactory for fodder, and of which seed is easily raised. Cuzco maize is therefore being discarded from future trials by the Department in this State.

# Farmers' Experiment Plots.

## MAIZE EXPERIMENTS, 1919–20.

### Central-western District.

B. C. MEEK, Assistant Inspector of Agriculture.

THE following farmers co-operated with the Department in maize experiments last season :—

G. J. Douglas, Fairfield, Coonabarabran.
N. S. Meek, Lindfield, Hobby's Yards.
J. Jones, Morbel, Canowindra.
W. Burns, Goongawarrie, Carcoar.
E. Blackburn, Belar Creek, Warkton.
J. I. Renshaw, Hampton Park, Binnaway.
J. Davidson, Merrigonowry, Cowra.

Results were only obtained at the first three places, the season being one of the worst yet experienced for maize in this district. Birds also played havoc with most of the plots, swarming down from the bush early and late for food which in ordinary seasons they rarely touch.

#### Details of the Plots.

*Canowindra.*—The experience of Mr. J. Jones is especially worthy of note in view of the agitation in the near west for some form of water conservation for irrigation. After a careful preparation of the soil in a paddock on the banks of the Belubula River, furrows were struck out 4 feet apart, and the seed planted at the bottom with a maize-dropper. As there was every indication of the continuance of the drought conditions then existing, a small pumping plant was purchased and erected at a cost of £85.

The first watering was given along the furrows on 10th December, and the plants showed through three days later. On 23rd December another watering was given, but the effort was wasted, as a storm of over 3 inches of rain fell in the next couple of days. The third and final watering was given on 21st February, as dry weather had again set in.

On about half the paddock, which could not be reached by pumping, practically no germination resulted, as the natural precipitation was too meagre, and occured at intervals that were too great; the irrigated section, on the other hand, gave yields up to 68 bushels per acre. Early frosts on 18th April and following days stopped all further growth, which accounts for the smallness of yields of the later maturing varieties. An occasional case of smut was the only disease noted, and a few cobs were attacked by earworm.

*Coonabarabran.*—Though planted on 5th December, there was very little growth on this area until January, so that only the quickest maturing varieties had any opportunity of giving useful yields. Longfellow Flint and U.S. 133 matured first, and grew to 6 feet in height. Golden Glow and Silvermine reached 10 feet.

Chinese Waxy, a South American variety, with a reputation for drought resistance, was tried here, but did not grow well, withering off badly in comparison with the ordinary varieties of maize.

*Hobby's Yards.*—Sufficient moisture was available here in the early stages of the crop's growth, but through most of January and February (which was the critical period) no rain of any consequence was registered. The earliest maturers were Minnesota 23 and North Dakota, and these grew to 3 feet 6 inches in height, with very fine stalk. Longfellow Flint and Early Canada Flint were next in order of maturity; they grew to 3 feet 6 inches and 4 feet respectively, and suckered considerably. U.S. 133 reached 4 feet, and Golden Glow 5 feet.

### The Results Reviewed.

The flint varieties are not favoured by farmers on account of the hard grain, but the dent varieties, Minnesota 23, U.S. 133, Golden Glow, and N. W. Dent (seed of which was not available this season) should well repay growers on the Central Tablelands and districts of short season, where December or January rains can be expected.

RAINFALL during the Growing Period.

| Month. | Coonabarabran. | Hobby's Yards. | Canowindra. |
|---|---|---|---|
| 1919. | Points. | Points. | Points. |
| October ... ... | ...... | ...... | 45 |
| November... ... | 42 | 91 | 45 |
| December ... ... | 83 | 237 | 366 |
| 1920. ... | | | |
| January ... ... | 262 | 212 | 70 |
| February ... ... | 154 | 26 | 29 |
| March ... ... | 44 | 95 | 92 |
| Total ... | 585 | 661 | 647 |

When sowing on the tablelands it is better to risk early frosts than have them affect the crop at the maturing stage. Young plants stand cold fairly well, and even if they are seriously damaged and replanting is necessary, the cost of this is not so great as that of the total loss of the season's growth, which may occur should frosts prevent the formation and maturing of the cobs. Cutting and stooking in the field for a few weeks when the grain is in the dough stage is a practice which minimises injury from frost; the stalks still have good value for fodder when thus treated.

Superphosphate hastens maturity, and is preferable for manure; mixtures with blood and bonedust tend to lengthen the growing period. When cobs are pulled on the green side, they should be husked at once and spread out thinly on the barn floor to prevent damage by mould.

With the exception of a few plants destroyed by army worms early in the season, no disease or insect pest was observed on the highlands.

RESULTS of Variety Trials.

| Varieties. | Coonabarabran. | Hobby's Yards. | Canowindra. |
|---|---|---|---|
| | bus. lb. | bus. lb. | bus. lb. |
| Early Clarence ... ... ... | ......... | ......... | 68 32 |
| Funk's Yellow Dent ... ... | Failed | ......... | 64 0 |
| Large Macleay Yellow ... ... | ......... | ......... | 62 48 |
| Gold Standard Leaming... ... | ......... | ......... | 53 24 |
| Golden King ... ... ... | ......... | ......... | 48 0 |
| Improved Yellow Dent ... ... | ......... | ......... | 40 0 |
| Golden Beauty ... ... ... | ......... | ......... | 37 40 |
| Yellow Mastodon... ... ... | ......... | ......... | 36 32 |
| Leaming ... ... ... ... | ......... | ......... | 36 24 |
| Red Hogan ... ... ... | ......... | ......... | 35 20 |
| Yellow Horse Tooth ... ... | ......... | ......... | 33 12 |
| Golden Glow ... ... ... | 14 30 | 21 46 | ......... |
| U.S. 133 ... ... ... ... | 19 30 | 13 46 | ......... |
| Canada Flint ... ... ... | ......... | 8 40 | ......... |
| Minnesota 23 ... ... ... | ......... | 8 0 | ......... |
| North Dakota ... ... ... | ......... | 6 30 | ......... |
| Longfellow Flint ... ... ... | 8 30 | 3 38 | ......... |
| Silvermine ... ... ... | 14 30 | ......... | ......... |

## North-west District.

H. BARTLETT, Assistant Inspector of Agriculture.

THE following farmers co-operated with the Department in carrying out variety and manurial trials with maize during 1919–20:—

J. F. Chick, Tenterfield.
H. Manser, Tenterfield.
J. Cowin, Tenterfield.
N. Ferris, Dumaresq.
J. C. Norman, Kentucky.
W. H. Lye, Tamworth.
R. R. Aiken, Gunnedah.
R. A. Warden, Mount Russell.

Owing to adverse conditions, comparative yields were only obtained with three plots. Even in these cases it is hardly wise to draw conclusions as to the merits of particular varieties of manures, as, had the season been normal, different results could have been expected. The plots at Dumaresq, Tamworth, Mount Russell and Gunnedah failed to produce results owing to

the dry conditions; so also did the trials on the property of Mr. J. F. Chick, Tenterfield, with the exception of that of Golden Glow, which yielded 15 bushels per acre, and in a very dry season was the only variety that matured grain worth harvesting. Brewer's Yellow Dent, Early Yellow Dent, U.S. 133, and Longfellow were cut for fodder at that centre.

Comparative yields were obtained from the following plots:—

VARIETY Trial at Mr. J. Cowin's, Tenterfield.*

| Variety. | Fertiliser per acre. | Yield. | |
|---|---|---|---|
| | | bus. | lb. |
| King of the Earlies ... | 1 cwt. superphosphate ... | 16 | 42 |
| Early Yellow Dent ... | ,, ,, ... | 9 | 16 |
| Early Yellow Dent ... | No manure ... ... ... | 9 | 9 |
| Brewer's Yellow Dent ... | 1 cwt. superphosphate ... | 11 | 42 |
| Early Canada Flint ... | ,, ,, ... | 7 | 5 |
| Golden Glow ... ... | ,, ,, ... | 9 | 10 |
| Silvermine ... ... ... | ,, ,, ... | 17 | 11 |

* Sown 23rd October, 1919.

MANURIAL Trial at Mr. H. Manser's, Tenterfield.*

| Fertiliser per acre. | Yield. | |
|---|---|---|
| | bus. | lb. |
| No manure ... ... ... ... ... ... ... | 12 | 8 |
| 1 cwt. P7 ... ... ... ... ... ... ... | 17 | 0 |
| ¾ cwt. M5 ... ... ... ... ... ... ... | 24 | 16 |
| 35 lb. nitrate of soda, 65 lb. superphosphate, 25 lb. potash | 20 | 2 |
| 1 cwt. P8 ... ... ... ... ... ... ... | 24 | 41 |
| 1 cwt. blood and bone ... ... ... ... ... | 28 | 38 |
| ½ cwt. superphosphate ... ... ... ... ... | 25 | 19 |
| 1 ,, ,, ... ... ... ... ... | 25 | 44 |

* Sown 21st October, 1919. The variety used was Brewer's Yellow Dent.

MANURIAL Trial at Mr. J. C. Norman's, Kentucky.*

| Fertiliser per acre. | Yield. | |
|---|---|---|
| | bus. | lb. |
| 1. No manure ... ... ... ... ... ... ... | 29 | 20 |
| 2. 1 cwt. superphosphate ... ... ... ... ... | 30 | 16 |
| 3. 1 ,, super., crop top-dressed with 1¼ cwt. P5 ... | 29 | 4 |
| 4. 1 ,, ,, ,, ,, ½ cwt. nitrate of soda | 29 | 0 |
| 5. ½ ,, ,, ... ... ... ... ... ... | 29 | 10 |

* Sown 13th November, 1919. Plots 3, 4, and 2 ripened 14 days earlier than plots 1 and 5.

The mixture P7 consists of equal parts of superphosphate and bonedust, P8 of equal parts of superphosphate and blood and bone, M5 of 2 parts superphosphate and 1 part sulphate of ammonia.

# Boys' Maize-growing Competitions.

THE success of boys' maize-growing competitions in America led to a movement in the same direction in New South Wales some years ago, but like many other enterprises it was arrested by the war. Lately there has been a revival of interest in the subject, and an agricultural and horticultural society recently asked the Department to outline the conditions under which such a competition might be conducted here.

The suggestions made in response to the inquiry may be of interest to other societies that contemplate a similar move. They were as follows :—

1. The competition should be open to all boys and girls under 18 years of age, a nominal entrance fee of 2s. 6d. being charged.

2. Applications should reach the secretary not later than a certain date giving (*a*) full name and address, (*b*) age at last birthday and date of birth.

3. The area should be one-tenth of an acre, and each competitor should be allowed to choose his own land, and methods of preparing, planting, and cultivating the crop. As a guide to the size of the plot, the following will be found useful :—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| With | 3 | feet between rows, | the total length | of rows | will be | 1,452 | feet. |
| ,, | 3¼ | ,, | ,, | ,, | ,, | 1,340 | ,, |
| ,, | 3½ | ,, | ,, | ,, | ,, | 1,245 | ,, |
| ,, | 3¾ | ,, | ,, | ,, | ,, | 1,175 | ,, |
| ,, | 4 | ,, | ,, | ,, | ,, | 1,089 | ,, |
| ,, | 4¼ | ,, | ,, | ,, | ,, | 1,025 | ,, |
| ,, | 4½ | ,, | ,, | ,, | ,, | 968 | ,, |

4. Any variety of seed may be used by the competitor. Seed might be supplied, if required, by the society free of cost.

5. Only one entry should be allowed each competitor.

6. The time of sowing should be restricted to one month—that most suitable for the district.

7. Each competitor should be required to keep a record, showing the dates and particulars of the different operations on the plot, and these records should be delivered at the time of harvesting to the officer who superintends the harvesting and verifies the yield.

8. Within a week from harvesting each competitor should select, without help, ten cobs of maize from his crop and forward them to the secretary.

9. Competitors should notify the secretary of the date of maturity of the crop, and when it is ready for harvesting.

10. No competitor should be allowed to employ any labour on the competition plot other than his own personal labour, excepting in ploughing or the driving of horses, for which help may be necessary.

11. The aggregate points should be 100 and they should be allocated in the following way :—

| | | |
|---|---|---|
| (*a*) Yield of plot... ... ... ... ... | 70 | points. |
| (*b*) Quality of maize (judged on 10-ear sample submitted) ... ... ... ... ... | 20 | ,, |
| (*c*) Notes and record of plot ... ... ... | 10 | ,, |
| | 100 | ,, |

12. Competitors may be present during the judging of the maize ears, when instruction may be afforded in growing and judging.

13. Three judges should be appointed, and their decision accepted as final.

14. In some cases points are given for the best showing of profit on the investment, based on the commercial price of maize and taking into consideration the interest on the capital value of the land or the rent, and allowing so much an hour (8d. or 9d.) for every hour worked by the competitor, 4d. or 4½d. per hour for time worked by each horse, 15s. per ton for animal manure, and for commercial fertilisers at market price. In these cases the points are usually equally divided for yield and profit per acre.

15. Bulletins and reading matter on cultivation methods, fertilisers, &c., might be supplied to the contestants. (These may be obtained from the Department, and can be supplemented by lectures and demonstrations by officers of the Department).

The records referred to, which should be kept by each contestant, are awarded points to encourage intelligent writing and discussion in the work. These records should be made as follows on forms supplied for the purpose:—

1. Name.................................... Age................. Birthday...............
2. Address..........................................................................
3. Character of the soil ..........................................................
4. Previous crop ....................................................................
5. Fertiliser and manure applied ..............................................
6. Dates and depths of ploughings ............................................
7. Subsequent preparation of land—dates and implements used ..............
   ..............................................
8. Date and method of planting ...............................................
9. Variety of maize..................................................................
10. Source of seed ..................................................................
11. Distance between rows ........................................................
12. Distance between hills or grains in row ..................................
13. Number of grains sown per hill ............................................
14. Cultivations, harrowings, or hoeings—dates and implements used.........
    ..............................................
15. Date of harvesting .............................................................
16. Any other remarks concerning growth of crop...............................
    ..............................................

The Department can supply your Society with seed of one or several varieties that may be regarded as suitable for the district.

After a few years of a competition of this kind the Department would be inclined to favour a contest of a different kind, which would have for its object the determination of the best yielding variety or strain of seed in the district.

## WANTED—COMMUNITY ENTERPRISE IN FARMING CENTRES.

THE average distance . . . to the nearest high school, . . . to the nearest church, and . . . to the nearest market, shows that the country people are far enough from the centre of trade, social, and religious activities to tempt the spirit of individualism, and to put their neighbourliness and piety to the test. It points to the importance of pooling individual interest in common community enterprises, such as canning kitchens, buying centres, markets, laundries, salvage shops, and sewing rooms, as well as social centres for lectures, community sings, dramatics and games, which, if properly handled, break down the isolation of country homes, and make possible the accomplishment of many otherwise difficult tasks with a saving of time and labour for the housewife, and often an opportunity for increased income as well as recreation for the entire family.—U.S. *Weekly News Letter.*

# Utilising Waste Heat in Butter Factories.

O. C. BALLHAUSEN, Dairy Instructor.

THE rapid increase in the price of fuel, whether coal or wood, and the further increases that are probable at no distant date, makes the efficient use of fuel at butter factories of the greatest importance. The production of power (and of the heat that produces power, whether by steam or suction gas plants) is always one of the largest items of expenditure. Since the advent of the pasteurisation of cream at practically all our butter factories, this item has been still further enlarged, and any means by which the outlay on fuel can be curtailed will commend itself to factory managers.

In recent years considerable attention has been devoted, in some places, to the power departments of butter factories, and many experiments with fuel and with boilers, and in the arresting and use of waste, or exhaust heat, have been carried out.

Probably no factory lends itself better and in more ways to the practical use of the heat, in exhaust steam or gas, than a butter factory, where large quantities of hot water are required all day. As this exhaust heat can be secured and used again, it will be seen that to allow it to escape unused is simply to waste a valuable by-product of the factory. Many of the larger factories do make use of most waste heat, but there are still many that make no effort whatever to supply themselves with an abundance of hot water at a very small outlay.

It is by means of hot water chiefly that the floors and drains of factories can be kept properly cleaned, apart from the washing of cream cans, all utensils, and a certain form of pasteurising, &c.

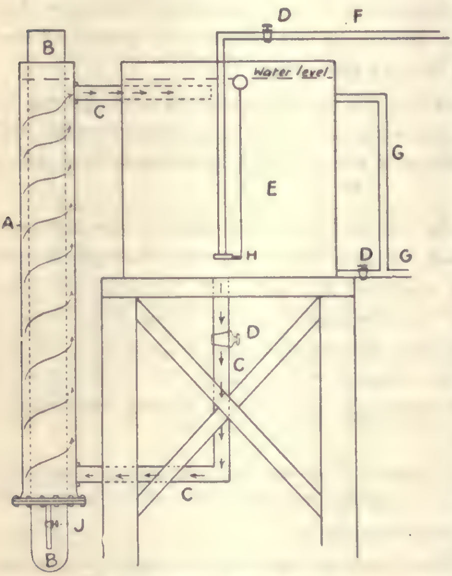
The use of direct live steam from the boiler for the heating of water for factory purposes adds heavily to the fuel bill and is therefore expensive. It is possible to minimise the use of live steam, and effect a big saving in fuel costs by utilising exhaust steam for the heating of boiler feed water, washing water and pasteurising. For the heating of boiler feed water there are several useful attachments on the market, all making use of exhaust steam for the purpose.

In small steam plants it is estimated that nearly 90 per cent. of the heat in live steam remains in the exhaust. If it were possible to collect the whole of this waste heat, and use it for heating boiler feed water, wash water, and water for the pasteuriser, the capacity of the boiler would be nearly doubled, and the fuel bill reduced by nearly one-half.

For every 10 degrees Fah. that feed water is heated, approximately 1 per cent. less fuel is required to generate a given amount of steam; and for each 10 degrees Fah. increase in feed water temperature, the boiler capacity is increased approximately 1 per cent. When hot water is used a constant

pressure on the boiler can be more easily maintained, and there will be an additional saving of fuel, attributable to more even firing. It is further estimated that the heating of feed water for boiler purposes from a temperature of 50 degrees Fah. to 200 degrees Fah. by means of exhaust steam will reduce the fuel consumption 13 per cent.—in other words, will reduce a £100 fuel bill to £87. Not only this, but the life of the boiler will be longer owing to the avoidance of expansion and contraction strains set up on the shell of the boiler by feeding with cold water.

It is estimated that in a factory where 800 gallons of hot water are used daily, and where it is heated by live steam from the boiler, approximately 127 lb. of coal are required daily to raise the temperature of that quantity from 50 degrees to 170 degrees Fah. If this amount of water was heated by means of exhaust heat, there would be a direct saving of 127 lb. of coal per day, or taking coal at 35s. 3d. per ton (the price delivered to factories at Lismore to-day), there would be a saving of about £31 15s. per annum. To emphasise the increase in the cost of coal to butter factories, and also the desirability of putting it to the fullest possible use, it may be recalled that coal was at one time landed at Lismore at 16s. per ton.




**Exhaust Steam Water Heater.**

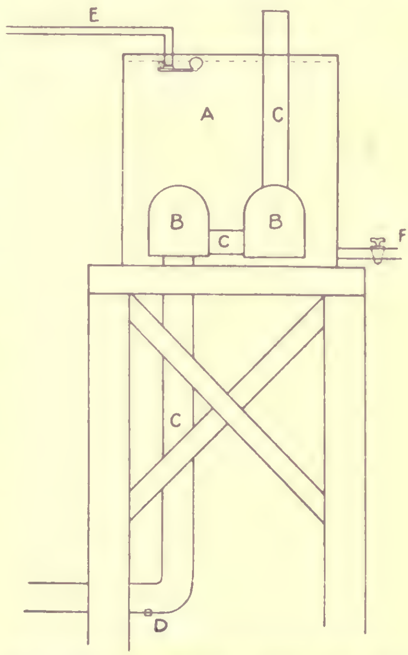
A. Jacket Cylinder. B. Engine Exhaust Pipe. C. Water Piping. D. Water Cocks. E. Water Tank on Stand. F. Cold Water Supply Pipe. G. Hot Water Supply Pipe. H. Ball Cock (wire and ball). J. Cylinder Drain Pipe and Cock.

Tank and pipes should be insulated.

It is also stated, that to heat 300 gallons of milk from 60 degrees Fah. to 145 degrees Fah. requires 30 lb. of coal, so that with that amount of milk an exhaust heater would effect an annual saving of more than 4 tons of coal. In factories where the holding pasteuriser is in use, this hot water can be used for pasteurising. If the water is not just as hot as required, live steam can be added to bring it to the desired temperature. One or two factories using the holding method have found it more effective to provide a large reservoir of hot water for pasteurising cream, sufficient for two or three pasteurisers to use at the one time, than the small vats usually provided for this purpose.

If the cost of an exhaust heating plant was considerable, the question would have to be determined whether the saving in fuel balanced the interest on the money expended in materials, labour, depreciation, &c. Fortunately the plant required is quite a modest one, and not beyond the resources of the

average factory engineer to construct. For a small factory a useful plant would consist of a 200-gallon square tank, with a vertical jacket round the exhaust pipe of the engine about 10 or 12 feet long. The jacket should be 4 to 5 inches greater in diameter than the exhaust pipe. The tank is elevated on a platform alongside the jacketed exhaust, and connected to the jacket by means of suitable lengths of piping at top and bottom. The tank jacket and piping are kept filled with water, and by means of the thermo-syphon principle the water is induced to circulate from the tank through the lower pipe to the jacket, thence upwards in the jacket and back again through the top pipe to the tank. This action is continuous, the water gathering more heat as it is allowed to continue circulating. It is a principle well known to motorists, as many motor cars use it in the reverse way to cool the engine, circulating water by subjecting it to a cold draught. For a small factory quite a useful heating of water can be secured in this way. It is advisable to insulate the tank, jacket and piping with some suitable material, to reduce the escape of heat into the atmosphere as much as possible.




**Water Heated by Exhaust from Suction Gas Engine.**

A. Water Tank on Stand. B. Engine Silencers. C. Engine Exhaust Pipe. D. Half-inch hole for drainage of any water in Exhaust Pipe. E. Cold Water Supply Pipe and Ball Cock. F. Hot Water Supply Pipe.

Tank and Hot Water Pipe should be insulated.

A method employed in larger factories where several steam pumps are in use, is to connect the exhaust of each to one common exhaust, and then to connect with a coil of piping immersed in a tank of water. The exhaust from three steam pumps with an aggregate of 5 horse-power in one of the North Coast factories produces boiling water in a 600-gallon tank in $1\frac{1}{2}$ hours and supplies a large factory with all the hot water required. A 300-feet copper coil, 3 feet 6 inches in diameter, 4-inch pipe and a heavy cast-iron tank (portion of an old sugar mill plant) is used. The tank is well elevated to deliver hot water to any part of the factory. The exhaust from the pumps first of all passes through a commercial feed water heater, afterwards passing through the coil mentioned. This plant has given the most satisfactory results, supplying hundreds of gallons of hot water daily.

Suction gas engines are frequently made use of at butter factories where fuel is expensive and difficult to obtain. The heat of the exhaust gas of these

engines is very great, and can be made use of quite simply in heating water. A factory near Lismore has for some years successfully made use of the exhaust from a gas engine to heat water for washing cans, scalding churns, butter-workers, &c. The circulating water from the gas engine cylinder jacket is conveyed to an old 6 horse-power galloway tube vertical boiler. The end of the engine exhaust pipe enters the boiler fire-box, and the exhaust heat and gases impinge on the tubes and heating surfaces of the boiler, and heat the water in the same way as a fire in the boiler would do. The water being already somewhat warmed by passing through the engine cylinder jacket, about one hour's running of the engine will give a good supply of hot water at about 160 degrees Fah.

In some factories using suction gas engines, only small boilers for supplying steam for heating water, steaming cans, and driving testing machines have been provided. Mostly these boilers were part of the factory equipment before the days of pasteurisation, and although amply sufficient then, it has been found that they are now too small to permit of all the steam requirements of the factory being met at the one time. This has necessarily meant the shutting off of steam from the testing room, wash-up, or some other portion of the factory to ensure a satisfactory head of steam to the pasteuriser, or else resorting to excessive firing of the boiler.

The engineer of one of the factories in this position, with a view to relieving the boiler from the heavy demand on it for steam and utilising the waste heat of a suction gas engine, decided to experiment with an exhaust heater, which has been an unqualified success, and has more than twice paid for itself during nine months' service. A 400-gallon square iron tank to provide a delivery of hot water to any part of the factory, was placed on a high stand near the engine-room. This tank was insulated with boards, and 4 inches of charcoal well packed round the sides and bottom. The silencer portion of the exhaust pipe of the 80 horse-power suction gas engine was placed inside this tank and covered with water, the top of the outlet pipe being above the top of the water. In practice the circulating water from the engine cylinder is run into the tank. This water being already warmed is further heated in the tank, and during the day a supply of water at an average temperature of 170 degrees is available. In the early morning, and before the engine starts, there is water hot enough for the buttermaker to rinse the churns, &c., owing to the tank being insulated. From 1,200 to 1,400 gallons a day are used through this heater, and the boiler is now only used for pasteurising, steaming cans, and testing. The heater provides all the hot water for washing down, washing cans, factory utensils, &c., and since its installation has resulted in about four hours less firing of the boiler per day being necessary.

The cost of the plant was about £25, exclusive of cost of erection, which was done by the engineer and his staff. This cost includes £18 for 200 feet of water piping to deliver the water at the far end of the building. This long length of piping is placed inside some old 2-inch piping, which provides a dead air space all round the smaller pipe and affords a very fair insulation. One of the features of this plant is the insulation provided to maintain the

temperature after the engine has stopped work for the night, and also the insulation of the water piping. Having regard to the cost of the plant, and the unusual type of engine from which the heat is derived, this is probably one of the best illustrations of what can be done in the way of utilising exhaust heat, and many other factories could also safely use this form of power.

## A Note on Rotted Manure.

Questions are frequently asked regarding the use of "well-rotted manure," its application to the soil and the addition to it of lime. The following reply to a recent correspondent will perhaps answer the query of a good many others :—

"Rotted manure"—a term one frequently comes across in gardening handbooks—is a description especially applicable to farmyard manure produced in Europe and America, where stock are stalled and bedded; the rotting produces changes, due to fermentation in the straw and similar materials, and converts it partially into humus. The term has scarcely the same application in this country, as rotting in this way does not take place to any extent, farmyard manure here being chiefly dung. If the manure is kept under cover, little change will occur, except that it will lose moisture; if it is exposed to the weather, rain will wash out some of the soluble constituents, and its fertilising value will be diminished.

Even under European conditions of rotting, the rotted manure varies very little in composition from the fresh, but is, on the whole, somewhat richer, owing to the fermentation of the insoluble organic matter, the disappearance of which increases the proportionate amounts of soluble organic matter and fertilising material, especially organic nitrogen compounds and phosphate of lime. Old manure, provided it has not been leached by the weather and thus deteriorated, has the advantage that it is not so likely to burn the plants, as fresh manure becomes hot owing to fermentation. The preliminary heating that the manure undergoes is also likely to destroy the germinating power of any weeds it may contain.

Lime should not be added with manures containing nitrogen, such as the above, because ammonia is driven off, not only from ammonium salts, but from blood, bones and any organic manure such as dung or stable manure. In such cases the escape of ammonia is apparent to the senses. If the mixture were buried in damp soil, no doubt this loss would be minimised, but as lime is usually applied on the surface of the soil and very lightly harrowed in, and the stable manure is also superficially applied, every facility is afforded for the ammonia to be driven off and lost to plant life.

It is generally a good practice to apply the lime two or three weeks before applying nitrogenous manures or sowing seed. If manure and lime are to be applied together, the best plan is to make a compost heap, in which the organic matter, bones, skins, &c., are fermented in the presence of lime, vegetable matter and earth, and the escaping ammonia is retained by the outer layer of moist earth—or better, thel ayer of powdered gypsum—with which the heap is covered.—F. B. Guthrie.

# Insects found on Tobacco in New South Wales.

W. W. FROGGATT, F.L.S., Government Entomologist.

WHILE investigating the damage caused to the tobacco crop by infestation by thrips, the writer collected a number of minor pests. Several of these, under favourable climatic conditions, might easily occasion serious loss.

In North America quite a number of moth caterpillars infest and damage the tobacco leaf, among the most formidable of these being the large handsome caterpillars of the hawk moths *Protoparce carolina* and *P. coleus*, popularly known in the United States as horn or tobacco worms, and where these caterpillars are numerous it is often necessary to spray the tobacco plant three or four times in the season with arsenate of lead. The bud moths (*Heliothis retrexiæ* and *H. armigera*), the latter common in Australia as the maize-cob moth, also damage the growing tobacco crop, gnawing both the buds and seed pods. The only moth caterpillar noticed by the writer in his recent examination of local crops was a rich green-coloured cutworm, which, though it pupated, did not develop into the moth ; but if these were numerous they could do a great deal of harm to the leaf.

### Tobacco and Potato Moth (*Phthorimæa operculella*).

This destructive little moth has a world-wide reputation as a potato pest. The moth lays her eggs in the eye of the tubers, into which the active little grubs burrow and feed. It is better known to economic entomologists under the name of *Lita solanella* ; but as it has been proved that it had been previously described under the name of *Gelechia operculella*, the former name has become a synonym; and it has now been further removed from both by the older genera, under which it had been in turn placed. This pest is known to the tobacco-growers in the United States under the name of "tobacco splitworm," from the habit of the larva of feeding in the midrib of the leaf.

The potato moth was first recorded as a tobacco pest in Australia by Olliff, in his "Entomological Notes," in this journal, vol. iii, p. 701 (1892). The writer in question bred it out of tobocco leaves growing at Tamworth. Some experiments were carried out at that time, but since then this moth has been quite lost sight of as a tobacco pest until the present season. As a potato pest it was described by the present writer in this journal, vol. xiv, p. 321 (1903), in an article supplemented with a fine coloured plate, giving the different stages of its life history.

During his recent investigations into the damage caused to tobacco by thrips, the writer's attention was drawn to the manner in which many of the stems close to the ground and the base of the large leafstalks were being attacked by a small moth caterpillar. Examination of the old seed-beds,

where many small, stunted, rejected plants had been left after the vigorous plants had been planted out, discovered them to be full of small caterpillars in all stages of development. As both potato and tomato crops are grown side by side with tobacco, and as these plants also belong to the same great natural order (*Solanaceæ*), the three crops would carry the caterpillar through the season, furnishing a regular food supply for the grub of the first broods, which often feed on the stems of the potatoes.

### How to Combat.

It is not advisable to grow and keep bagged potatoes in the vicinity of the tobacco fields, and the increase of the moths would be considerably checked if all rejected and waste tobacco plants, potato stalks and tomato vines were regularly cleaned up and burnt. The moths emerging from the drying tobacco stalks would then have little suitable food upon which to lay their eggs.

Spraying as carried out for the hawkmoths in the United States would not have much effect upon these burrowing caterpillars.

### The Rutherglen Bug (*Nysius vinitor*).

This omnivorous little plant-bug was found in many places upon the green tobacco leaves, but not in sufficient numbers to be considered a pest. As there are very few field crops of this kind that it does not attack at some time or other, however, and as climatic conditions might arise conducive to its appearance in such numbers as to be a very grave danger to tobacco-growers, it is a pest well worth watching. Any waste land or rubbish on the adjacent paddocks should be burnt over on the first appearance of these tiny silver-brown bugs.

### The Green Leaf Jassid.

In some parts of the tobacco fields these delicate green leaf-hoppers were very numerous on the leaves' upper surface. The perfect insects are of the usual slender, wedge-shaped form, broadly round on the front of the head, with the wing covers reaching beyond the tip of the abdomen. This insect measures 3½ mm. in length, and is of a uniform bright-green tint, which, however, fades to a duller green, diffused with yellow, on the body and legs after death.

### The Mottled-winged Tobacco Bug (*Dicyphus tabaci*).

In Dr. Howard's "Principal Insects Affecting the Tobacco Plant," reprinted from the U.S. Department of Agriculture Year Book, 1898, there is a description and wood-cut of a plant-bug known in the United States as the "suck-fly" or "tobacco-bug." This insect had been originally described by Uhler as a tomato pest under the name of *Dicyphus minimus.* Later it extended its range into the tobacco plantations, where in any late or neglected fields left over after the main crop had been cut, it did a considerable amount of harm. Two distinct species of small green plant-bugs were found in considerable numbers upon the underside of tobacco leaves at Tamworth, but as the damage caused by the thrip infestation overshadowed everything else, it was difficult to determine the amount of damage caused to the leaf by these plant-bugs.

Our species agrees so closely with Howard's figure and description that it is here given specific rank under the name of *Dicyphus tabaci.* It is a long-legged, slender, pale-green bug, with dark-brown, prominent eyes; the basal half of the first joint of the antennæ and the basal and apical portions of the second are blotched with dark brown, with the apical joints dull yellow. The rostrum is long, clouded at base, and with the extremity black; legs long, with the base of the tibia of the first and second pair of legs and the tips of the tarsi of the three pairs marked with black. Tegmina with the apical nervures outlined and clouded with black, looking like a double row of black blotches across the hind portion. The whole of the dorsal surface and legs are clothed with stiff, scattered, dark hairs. Length, 4 mm.

### Small Green Tobacco Bug.

A second green bug, found upon the foliage in company with the previous species, was of a uniform vivid green colour, changing to a yellowish-green tint at death; the whole surface clothed with scattered, fine, yellow hairs, stoutest and darkest on the legs and antennæ; eyes brown; tip of rostrum and tips of tarsi black; the head short and narrow, with eyes large and globular. Antennæ composed of four joints, first thickened, second slender, and three times the length of the first. Thorax contracted behind the head, fitting close to the abdomen; the whole insect viewed from above broadly oval. Length, 5 mm.

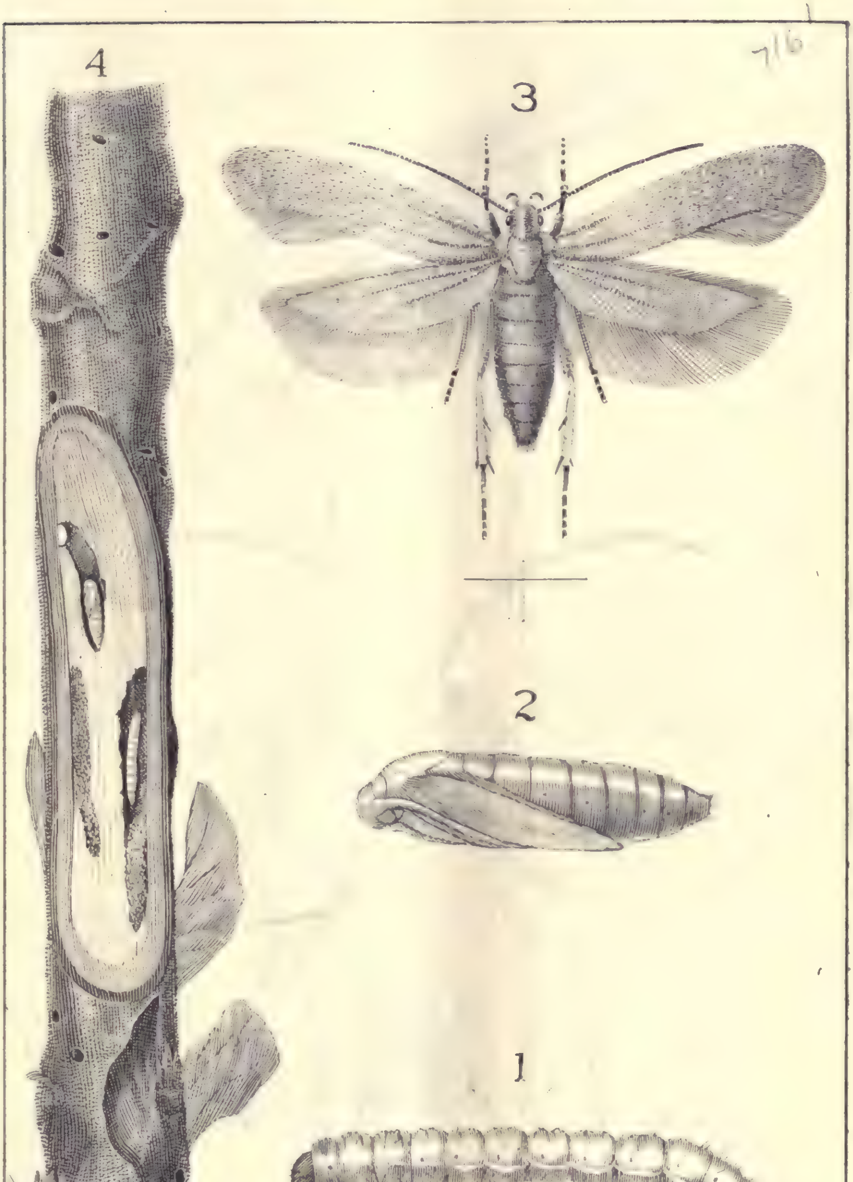
## The Production of Ginseng.

Inquiries are received from time to time on the subject of ginseng-growing in New South Wales, and lately an officer of the Field Branch of the Department was instructed to call upon a farmer in the Bega district who some years ago published a small book on the subject, copies of which (together with a package of seed) were sold at 5s. each.

It was gathered from this farmer that he had no ginseng plants to show, but it appeared that he had once raised a plant, which, however, did not live for more than a few months. As far as could be learned, this farmer had had no practical experience anywhere in regard to it, and further inquiries did not disclose that anyone else in the Bega district had attempted the crop.

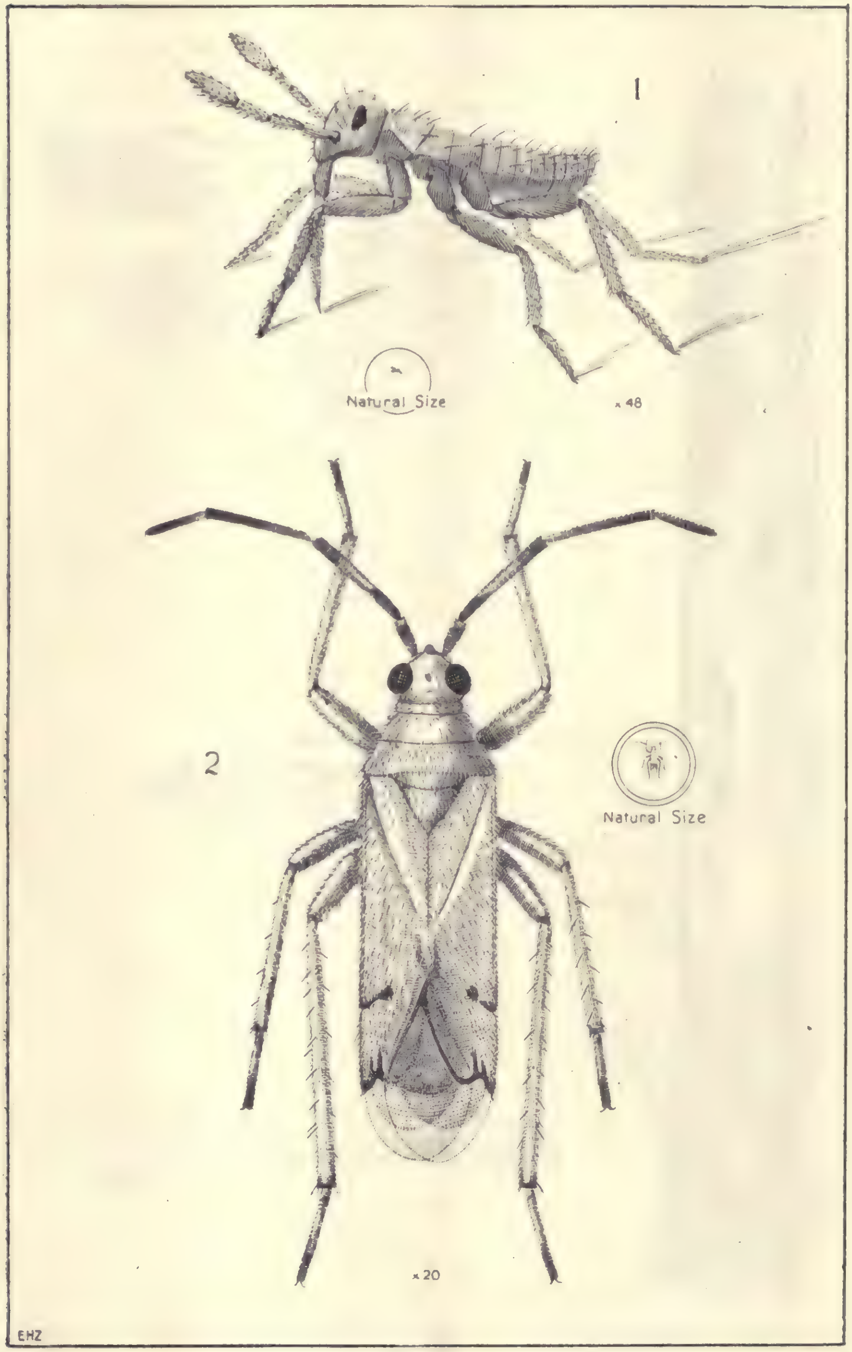
It was gathered, too, that the seed could not at present be imported, as the Koreans are not allowed to export it. Some expense seems to be necessary to provide a permanent shelter for the crop, which may be raised from seeds, though these do not germinate for eighteen months, having in the meantime to be carefully supplied with moisture. The roots are not fit for harvesting until five years after the plants are up.

The business of agriculture is different from that of most industries. It gives the all-round man a chance to use his talents. It is not a matter of doing the same thing over and over again day after day, as in some factories, for every month and every day brings its own special problems on the farm, and the man who is ingenious and clever at doing a variety of things has a chance to make good.—E. T. Meredith, U.S. Secretary of Agriculture.



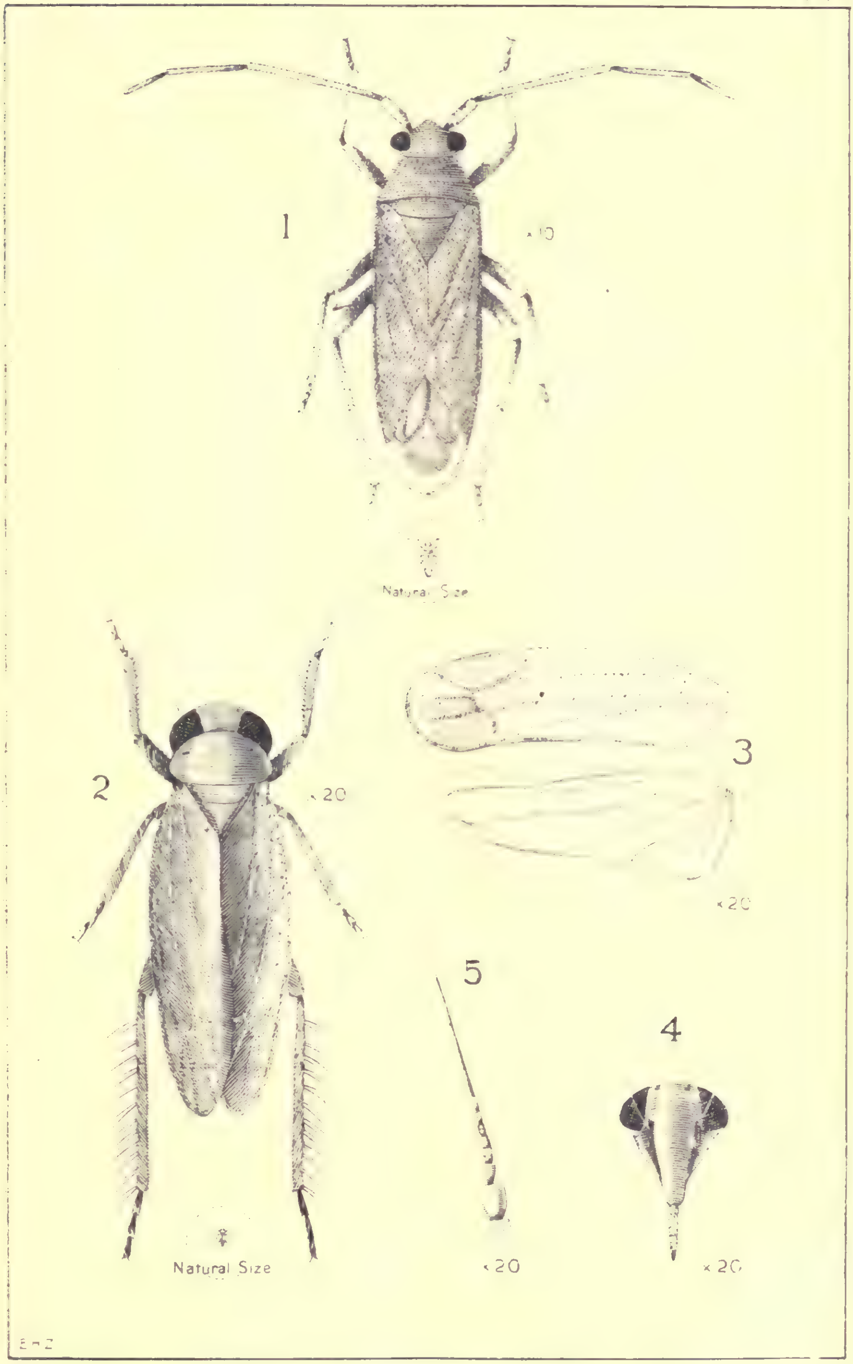

**Tobacco and Potato Moth** (*Phthorimæa operculella*).

1. Larva. 2. Pupa. 3. Moth. 4. Stem of a Tobacco plant, showing damage caused by a larva.




**Mottled-wing Tobacco Bug** (*Dicyphus tabaci*).

1. Young larval Bug. 2. Adult Bug.




**Two other Insects Infesting Tobacco.**

1. Small Green Tobacco Bug. 2. Green Tobacco Jassid. 3. Wings of Jassid. 4. Rostrum of Jassid.

**Crown-gall of Fruit Trees.**

Hard form of crown-gall at the lower end of the scion in a root-grafted apple tree.

Hard form of crown-gall surrounding the union in a root-grafted apple tree.

*(Both after Hedgcock.)*

# Crown-gall of Fruit Trees.

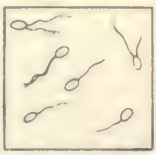
W. A. BIRMINGHAM, Biologist's Assistant.

THE organism responsible for the production of "crown-gall" (*Pseudomonas tumefaciens*) is a microscopic plant belonging to the bacterial group, illustrated in the little sketch on this page.

It is decidedly contagious, infection often taking place through wounds induced by grafting and by careless cultivation. The disease shows its effects by enlargements near the crown, or on the roots of various plants, as shown in the accompanying illustration. These galls vary in size, ranging from the size of a marble to an area that can be measured in inches.

In most cases infection takes place in the nursery, and the disease passes unnoticed by the grower when planting out his trees. Crown-gall greatly retards the growth activities of the tree, and the amount of injury is affected by the length of time the tree has been galled, and by the location and extent of the injury. The disease is one which progresses slowly, stunting the plant first, and finally destroying it.

The organism responsible is remarkable for the great variety of plants that it attacks. In America it is to be found on apple and pear, all stone fruits, grapes, berries, walnut, beet, tomato, tobacco, &c. It occurs in Europe, South America, and South Africa; and in New South Wales we have from time to time received specimens showing similar conditions on pear and peach trees.



Flagella of *Pseudomonas tumefaciens* (after Lœffler).

All our attempts to isolate the causal organism from specimens received have, so far, failed, probably owing to the age and hard, woody nature of the galls.

A "hairy-root" condition of apple-trees has been shown by Erwin Smith, Brown and Townsend, to be due to an organism indistinguishable from that causing crown-gall. The organism is not located in the hairy roots themselves, but in the flattened tumour from which such roots arise. The disease can be communicated in a number of ways :—

1. By the water of irrigation.
2. By the implements used in cultivation, and
3. By insects.

### Preventive Measures.

No satisfactory method of treating the disease has been devised. Cutting out the galls and treating the cut surfaces with germicides has failed to arrest the development of the disease.

When detected, diseased trees should be dug out and burnt, and any implements used in the operation should be dipped in a bucket containing 5 parts of formalin to 100 parts of water, before use elsewhere.

The ground from which trees are removed should receive a generous dressing with quicklime, and the soil should be repeatedly turned over and exposed to the sun and allowed to remain idle for twelve months.

Growers should carefully examine all young trees before planting, and reject those showing any suspicious outgrowths.

Nurserymen can safeguard the grower by dipping grafts just before planting in a thick bluestone paste. This method of treatment has given satisfactory results in America, one company having treated 500,000 apple-trees in one year. The bluestone paste can be made as follows :—

$1\frac{1}{2}$ lb. copper sulphate (bluestone).
4 lb. quicklime.
$1\frac{1}{3}$ gallon water.

Dissolve the bluestone in portion of the water and the lime in the remainder, and then mix both together to make the paste.

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## To Protect Stored Maize and Wheat from Weevil.

The cheapest method of treating a large quantity of grain in bags to protect it from weevil is to fumigate it in lots of twelve to twenty bags at a time, pouring into the top of each bag 1 to 2 fluid oz. of liquid carbon bisulphide, placing the bags side by side on a tarpaulin or canvas sheet, and then folding over the sides of the sheet so as to overlap tightly, and covering the whole with bags or another tarpaulin to further help to keep in the fumes. A "tryer" (sampler) serves as a useful funnel for running in the liquid, the heavy fumes of which sink down through the grain. Each lot of bags should be exposed to the fumes for not longer than twenty-four hours. Neither the liquid nor fumes, used as above directed, will affect the grain for food or seed.

Fumigation should be carried out, if possible, on a warm day (say with a temperature of 70 degrees Fah.), as at a temperature below 60 degrees Fah. the fumes become less effective. The bulk of the weevils will be killed by this process, but the bags should be inspected every two months, and if they show signs of re-infestation they should be given further treatment. Care should be taken that no fires, lights, or lighted pipes or cigarettes are near when handling the liquid or fumigating, as the fumes are inflammable.

If an empty galvanized iron water tank is available, it may be used with advantage in place of tarpaulins, as the lid can be sealed (by placing a ring of rubber tubing or a bag under it) and kept down by weights when the infested grain has been emptied in. Moreover, as in such a receptacle the fumes are much more effectively held, only 1 oz. of liquid to four bags (that is, to every 15 cubic feet of space in the tank) need be used.

Carbon bisulphide costs 1s. 6d. per lb. if purchased in small quantities, but it may be purchased more cheaply in 1-gallon tins, and more cheaply still if a number of such tins are bought at a time.

It may be added that maize has been successfully stored and kept free from weevils for a long period at Grafton Experiment Farm by using pure dry carbon dioxide gas from cylinders, at a cost of only 1d. per bushel for gas.—W. B. Gurney, Assistant Entomologist.

# Planting Sudan Grass.

H. J. KELLY, Manager, Cowra Experiment Farm.

To get the best results from Sudan grass the land requires to be well prepared by fallowing in the autumn or winter months, and broken down by spring-tooth harrows at the approach of spring. Prior to planting, the land should be harrowed and brought to a fairly fine tilth. Very rough land may require rolling, and in the drier districts it is preferable in any case to roll the land just before drilling, as the seed can be sown at a more uniform depth when the surface is levelled and made compact, and the rolling also induces the moisture to rise toward the surface, and thus further ensures germination.

**Sudan Grass on Mr. A. W. Stacy's farm, "Camelot," Tumut.**

Photographed seventy-five days from planting; yield of green fodder per acre, 7¾ tons.
Photograph supplied by Mr. G. C. Sparks, Inspector of Agriculture.

## Planting Season.

Seed should be sown early in the spring, as soon as the danger of frost is past. Sudan grass should be used as an annual, and it is therefore advantageous to make the season as long as possible by sowing early.

### Quantity of Seed to Sow.

This will vary to some extent according to the district in which it is to be sown. In very dry districts, where it may be better to plant it in drills 21 inches apart, 4 to 5 lb. per acre is sufficient, but in districts with an average rainfall of 22 inches and over, up to 8 lb. per acre, sown broadcast or through every hoe of the seed-drill, is recommended. When sown broadcast or through every drill hoe, the strain on the harvesting machinery is not so great during cutting as when it is planted in rows some distance apart, the machine being jarred considerably when it strikes the row.

### After-cultivation.

When the seed is drilled in, the land requires to be left undisturbed until the young plants are well above the ground and firmly rooted, when a cross-harrowing, to prevent evaporation and level the ground for harvesting machinery, should be given. A similar harrowing is also advisable after each cutting has been removed.

## Gumming of Sugar Cane.

The symptoms of gumming in badly affected cases are most marked and unmistakable, but careful discrimination is required to detect the disease in its early stages. Thus, there is always a danger that slightly affected canes may be reserved for seed purposes, either (1) because the grower has not noticed the symptoms of the disease, or (2) because he imagines that such slight infection cannot result in much harm.

Too much stress cannot be laid on the fact that diseased sets will result in diseased stools.

The following measures are recommended as essential to the production of a clean crop:—

1. Reserve the healthiest portion of the crop for seed purposes. Make a separate heap of such canes when cut.
2. After the canes have sweated in the stacks, examine cut ends carefully and reject any showing the slightest signs of gumming.
3. In cutting up the cane for sets avoid shattering of canes. Disinfect knife by dipping in a solution of formalin (5 parts commercial formalin, 100 parts water) or cresol (10 parts cresol, 100 parts water) before cutting each cane.
4. Burn off trash before planting.
5. Do not replant to cane any land which has previously produced a seriously gummed crop. Adopt a rotation.
6. Avoid badly-drained land when possible. It predisposes to the disease.

—R. J. Noble, Assistant Biologist.

*Correction.*—In the August issue, page 575, line 20, should read:—"Recent research has shown that certain parasites of horses and cattle, notably the worm producing tumor-like growths in the stomachs of horses, and probably that producing worm nodules in cattle, are fly-borne."

# Sunflowers as Silage.

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

GIANT sunflowers have been sown on different occasions in many districts of New South Wales as a seed crop on a small scale or as a novelty. The seed is of value as poultry and bird feed, but it has never become a recognised farm crop, partly because of the limited market and partly because low-priced seed can be imported from countries in which labour is cheap. Moreover, sunflowers cannot compare as a seed crop with maize, for on soils and in districts where sunflowers will produce 1,500 lb. of seed per acre (which is considered to be an average yield) maize or broom millet will be much more profitable.

Revived interest has been taken in the subject of sunflowers as a silage crop in America recently, interest which has been further increased by reason of the greater yields of green fodder obtained from sunflowers as compared with maize, more especially in cold climates. It is in the coldest States of America that the high yields of sunflowers as compared with maize have been obtained, and where the crop has been used for silage. In Canada yields of 39 tons per acre of green fodder are said to have been obtained from sunflowers as compared with 14 tons per acre from maize. In Montana* 36 tons of sunflower green fodder were obtained under irrigation in 1915, and 22 tons per acre without irrigation in 1916. These yields are said to have been from two to four times as great as the yield of maize green fodder. In Nevada† sunflowers yielded 23 tons of green fodder per acre as against 14 tons for maize.

The yield of fodder obtained from sunflowers is regarded as likely to be much heavier than that of maize where the latter does not mature a good grain crop on account of the cold and short growing season. Not only will sunflowers start growth more quickly than maize in early spring in these cold climates, but they will reach the fodder stage a few weeks before maize, and thus be harvested for the silo and out of danger from frost, which often cuts maize before the best fodder stage is reached. In fact, it has been shown that sunflowers will also withstand frost better than maize—not only in the early stages of growth but also in the later ones. Sunflowers are not especially drought-resistant; they have been known to make very good growth on little rainfall, but it is doubtful whether they are at all comparable with grain sorghums under semi-arid conditions, though they may be more drought-resistant than maize.

In Canada it was reported that sunflowers were fed as green fodder to cows over thirty years ago, and while they were not found to affect the flavour of the milk, they were said to cause purging when fed in large quantities.

* Montana Agr. Expt. Sta., Bull. 118 (Sept., 1917).
† Nevada Agr. Expt. Sta. Rept., 1919.

In Montana* chopped green sunflowers about one third in bloom are claimed to be equal to chopped green corn in the roasting stage as a soiling crop for dairy cows. Although relished to some extent by cattle as green fodder, sunflowers would seem to be more essentially a silage crop, and it is in this form that they have recently come into favour.

Over thirty years ago sunflowers began to attract attention as a silage crop in Canada. At that time only the sunflower heads were used in a mixture (known as Robertson's mixture), obtained by growing 2 acres of corn and horse beans to ½ acre of sunflowers. At the present time the whole plant is mostly used for silage, but usually in a mixture with maize in about equal quantities of each.

An analysis of sunflower silage in comparison with maize silage is given by the Idaho Agricultural Experiment Station as follows:—

| | Water. | Ash. | Protein. | Crude Fibre. | Nitrogen-free Extract. | Ether Extract. |
|---|---|---|---|---|---|---|
| Sunflower silage ... | 81·0 | 2·2 | 2·4 | 4·6 | 8·9 | 1·1 |
| Maize silage ... | 73·0 | 1·7 | 2·1 | 6·3 | 15·4 | 0·8 |

The following digestible nutrients are given by the Montana Agricultural Experiment Station† :—

| | Dry Matter. | Crude Protein. | Crude Fibre and Nitrogen-free Extract. | Ether Extract. |
|---|---|---|---|---|
| Digestible nutrients in 100 lb. sunflower silage .. ... ... ... ... | 21·4 | 1·24 | 10·13 | 0·37 |
| Digestible nutrients in well matured maize | 26·3 | 1·1 | 15·00 | 0·70 |
| ,, ,, in immature maize... | 21·0 | 1·0 | 11·40 | 0·40 |

These figures show that sunflower silage (made from a crop that is about one-third in bloom) compares favorably in total digestible nutrients with maize silage made from immature maize, and entirely disprove the idea that sunflower silage is too woody. It is also claimed that animals have been fed for thirty days on sunflower silage only, with no apparently harmful results, and that no objectionable flavour or odours have been found in the milk from cows on soiled or siloed sunflowers.

In a previous bulletin by the same station‡ it is stated that an average daily consumption of 34 lb. sunflower silage resulted in a saving of 9 lb. clover hay, and at the same time increased the milk and butter yields. On the other hand, it has been reported from other sources that sunflower silage is not relished as much as maize silage, and that, although it has nearly the same feeding value as maize silage, it is not quite as good for milk production. Even if this be the case, it must be allowed that there are few plants

* Montana Agr. Expt. Sta., Bull. 131 (1919).
† Montana Agr. Expt. Sta., Bull. 131 (1919).
‡ Montana Agr. Expt. Sta., Bull. 118 (1917).

which are equal to maize for ensilage, and that the much greater bulk of sunflower fodder which can be grown in cold climates, as compared with maize, at once places the former crop in a good position if satisfactory silage can be obtained from it at all. The Department has therefore made arrangements to have sunflowers tested as a silage crop on some of its experiment farms this season, and also to get some data as to yields in the colder portions of the State as compared with maize.

A few hints as to the method of growing sunflowers are given here for those who wish to make a trial of this crop.

For fodder or ensilage the rows should be 3 or 3½ feet apart and the plants 6 to 8 inches apart in the drills. From 10 to 12 lb. of seed per acre will be required, and sowing can be made with the maize drill or with the wheat drill by sowing through three tubes. Under irrigation about 15 or 16 lb. of seed per acre should be used, while in the drier districts about 6 lb. per acre will be sufficient.

The cultivation should be similar to that of maize, the keeping of the crop clean and free from weeds in the early stages of growth being the first essential. Cutting for fodder or ensilage can begin when the plants begin to flower; this will usually be about three months after planting. It is imperative that the last of the crop should be cut by the time it is half in bloom. A heavy crop is difficult to cut with the maize binder, and unless handled carefully the large heads are somewhat difficult to put through the cutter.

Until the results of some of the Departmental tests with the production and feeding of sunflower silage are available, it would be advisable for any farmers who grow sunflowers this season for silage to mix them with maize in about equal quantities as they go through the cutter into the silo

The Department has introduced a few of the best varieties from America and Canada for trial, and these will be tested this season at one of the experiment farms for fodder production.

## MINNESOTA'S DAIRY INDUSTRY.

THE Minnesota Farmers' Institute Annual illustrates the growth of the dairy industry in that State in the following figures :—

| | 1890. | 1918. |
|---|---|---|
| Number of cows ... | 566,000 | 1,368,000 |
| Milk per cow ... ... | 2,800 lb. | 4,325 lb. |
| Butter-fat per cow ... | 110 „ | 164 „ |
| Earnings per cow ... | 15½ dollars | 80¼ dollars. |
| Gross returns... ... | 8,700,000 „ | 109,768,000 „ |

It is to be feared that a similar comparison for New South Wales would not be nearly so striking, but dairy-farmers have the opportunity in their own hands. Knowledge of the production of each individual in the herd and of the hereditary value of the bull are the elementary essentials.

## Reinfection of Pasteurised Cream from Dusty Roads.

Recently it was necessary to visit a factory situated on the side of a road that is noted for its dustiness and along which considerable traffic passes. The yard of the factory on to which opens the cream platform, the pasteuriser and the cream pipe-coolers, was also subject to invasions of dust, although the company had been advised to asphalt or concrete it. At the time of the visit these conditions were considerably modified through rain having fallen during the night, and also through it being a calm day. However, as the cream was being passed over the exposed pipe-coolers from the pasteuriser, a plate was exposed for five minutes within a few feet of the cooler, in order to ascertain if, under the good conditions prevailing that day, any reinfection of the pasteurised cream was taking place by dust-borne germs. The accompanying photograph shows the result of this exposure, and demonstrates

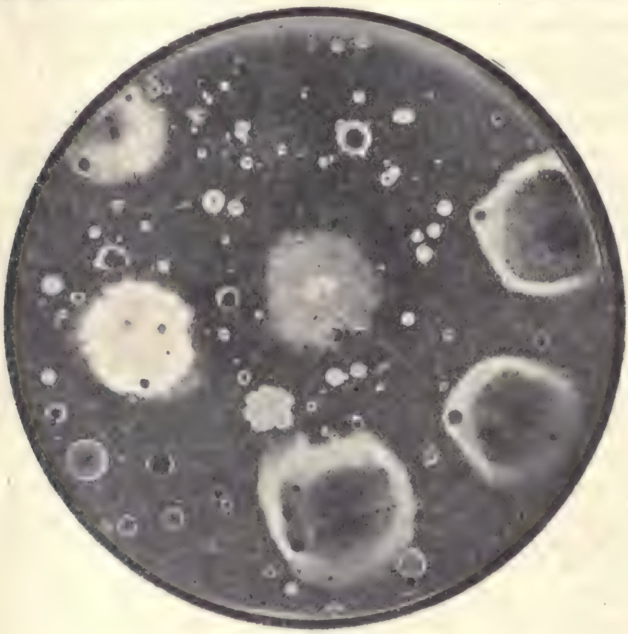


**Plate Culture from Air Exposure.**
Indicating contamination of cream by dust, even after rain.

the enormous amount of contamination that was taking place even under such favourable conditions. It can be imagined how great the reinfection must be on a windy, dusty day. The organisms shown largely belong to the coliform group, and evidently they come from the manure of horses and other animals, which, after being pulverised into dust in a dry state, has impregnated the surrounding atmosphere.

A factory so situated should have its yard concreted or asphalted, and steps should be taken in conjunction with the local authorities to have the road in front of the factory either oiled or asphalted, in order to keep down the dust. Dairy factory companies incur much expense in pasteurising cream and then neglect simple means of maintaining the improved conditions. It is intended in future to take more active steps to have the dust nuisance abated in such cases.—L. T. MacInnes, Dairy Expert.

# Safeguarding Farm Stock from Disease.

## (3) By Correct Feeding.

MAX HENRY, M.R.C.V.S., B.V.Sc.

Under this heading correct methods of feeding and the use of suitable feeding materials are to be included, as both have a very important bearing on the health of stock, and their influence has been very markedly emphasised during the late drought.

The study of dietetics is only in its infancy in this country and has not yet assumed its true position of importance, but it will, like the question of good hygiene, come more and more to the front as the country becomes settled. There is, and always will be, much opportunity for the veterinarian to effect an economic saving of no mean importance by giving advice on matters which have already been worked out, and by research into new methods and the adaptation of hitherto unused sources of food supply to the conditions of stock-raising in this State. Scientific feeding is economic feeding with all classes of animals; its neglect here is due to the fact that the vast majority of our stock has been, and still is, entirely paddock fed This state of affairs is steadily passing away; and with the continued cutting up of large estates, the extension of mixed farming and irrigation, and more intense working of the land, it will become more and more necessary to hand-feed stock of all descriptions, except, of course, in those areas of the State which will for very many years, and probably for all time, remain in large holdings.

This change of conditions does not only apply to large stock but also to sheep, which, if not hand-fed, will in the future be grazed by methods very different from those at present employed. These methods will approximate more and more to those existing in Europe and will involve a greater subdivision of farms, the growing of crops solely to be fed-off by sheep, and the feeding-off of several small paddocks in rotation in place of one or two large ones.

In these articles the principles which should govern the feeding of each class of stock are briefly referred to, but no attempt is made to go deeply into the chemical composition of feed or to adjust too nicely the balance of the different food constituents required. The various diseases which are commonly associated with errors in feeding are indicated, together with the measures to be adopted to prevent these conditions.

### The Value of Foodstuffs.

It may be well to point out that undue reliance must not be placed on chemical analysis only in estimating the value of a food, and that the nutritive values ascribed to various foodstuffs solely on that basis are liable

to be very misleading. A most important modification in assessing these values is introduced by the question of digestibility, and in estimating this quality actual experience is of the greatest value although much good work has been done by direct experimentation.

The difference in the requirements of the various classes of animals introduces a further modification, since the power of digesting many kinds of food varies greatly, as would be expected if the anatomical structure of the animals and the physiological processes of digestion were considered. Thus, rough, coarse material which can be well utilised by cattle will simply pass through horses in an undigested condition; and again, the amount of concentrated food which they can utilise is greater than that assimilable by horses. From the point of view of health, the composition of the food is, in practice, of more importance than its quality; and while improper methods (either avoidable or otherwise) are responsible for very heavy losses yearly, bad food—that is, food affected with rusts, moulds, &c.—or of such very poor quality as to be directly harmful, is only occasionally responsible for ill-health and death. This fact emphasises the responsibility of the stockowner himself; in not a few cases, however, the improper methods are almost unavoidable, either because suitable feeding stuff is not available or financial conditions prevent its purchase.

## THE HORSE.

To attain the maximum of efficiency a horse requires food in which the concentrates (grain, &c.) and the roughage (chaff, hay, straw, &c.) are more or less correctly proportioned. For resting horses, or those doing little and slow work, all concentrates may be cut out, but the harder or faster the work to be performed, the greater the proportion of concentrated food required. This principle must not, however, be pushed too far, since on a diet of concentrates alone the horse fails properly to utilise the food given him, and a certain quantity of roughage is essential to digestion and comfort.

If the ration of the army horse, which was called upon to do regular and hard work, is taken as a basis, it will be seen that one of equal parts (roughly) of grain and hay or chaff, varying from 10 to 15 lb. of each for light and heavy horses respectively, the medium coming in between on 12 lb., was found to be the most satisfactory. The undoubted success which attended the use of this ration would incline us to accept it as a standard. Whenever a reduction has to be made it is always preferable to make it in the chaff or hay. With horses in this country it is often difficult to estimate just what they are getting, owing to the custom of cutting oats and wheat in the unripened state for chaff; some of the best samples of chaff are very nearly equal to a half grain ration, while other samples are hardly above straw value. This must be taken into consideration in estimating the amount of grain to be added to produce a good ration.

Broadly speaking, there is a decided tendency to over-estimate the value of the average chaff ration and to undervalue the use of grain in conjunction with it. Instances have occurred during the recent dry period when it was cheaper to buy oats than chaff, taking into consideration their respective

food values and the quantity required as a maintenance ration. One of the objections to a ration composed solely of chaff, especially if of inferior quality, is the large quantity required and the consequent amount of labour imposed on the digestive organs of the horse in extracting sufficient nutritive material to supply his wants. A smaller quantity of grain will give more nutritive material at the cost of less energy to the horse and less money in freight and trouble in handling to the owner.

Where horses are partly grass-fed and partly hand-fed, the value of grain as against chaff is very high because the horse is getting his roughage himself. When the grass is on the dry side, sufficient roughage is obtained in this way to supply his needs in that direction. To balance his ration, however, grain is required, and the comparative prices and food values should be considered when deciding which to purchase. Too often advice to improve a ration is interpreted to mean give more chaff, and so the animal is still further overloaded. A ration containing too great a proportion of concentrates will, if maintained for long, lead to impairment of digestion and waste, owing to improper assimilation, while a diet containing too much roughage will not permit of constant heavy work and is liable to lead to impaction.

## Methods of Feeding.

Whatever the feed given it should be well divided. The horse does best if fed little and often, but conditions of work reduce the maximum number of feeds practicable to three or four, all of which should preferably contain both grain and chaff. Probably the best system, if it can be managed, consists of three roughly equal feeds of mixed grain and chaff and a feed of hay the last thing at night. But conditions differ so greatly in the town and the country, and the amount the horse gets from the paddocks varies so widely that each case has to be dealt with on its merits. Feeding should be as regular as possible if the best results are desired, and no sudden changes of food should be given if they can be avoided. New foods should be introduced gradually. Watering should precede feeding, and the horse should always have water available even when eating.

When arrangements to such an end are practicable, each horse should be fed separately; the custom of feeding many horses from long troughs is wasteful and leads to the bolting of the feed on the part of greedy animals and the underfeeding of those weaker or of more slow-eating habit. Bolting of the food and consequent imperfect mastication, prevents the animal deriving the full benefit of its ration, as much is passed through improperly digested—often with serious results. With teams continually on the move, long trough feeding may be unavoidable; but in standing camps and on farms the extra labour and cost involved in providing partition rails should be more than recouped by feed economy and lessened risk. The use of nose bags is worthy of greater consideration than it receives, for they provide a method of accurate feeding, ensuring extra feed to those animals which require it. The idiosyncrasies of various animals with regard to diet are worth some study, as a ration which will keep in condition an animal with good

digestive and assimilative powers, and one which eats slowly, may not be sufficient for other horses. Peculiarities of this nature can only be known and dealt with by the man in charge of the horses.

Salt is usually supplied to horses, and is much relished by them, but it is not taken in quantities large enough to have much influence on parasitic or other disease as is usually supposed. It probably acts more as an aid to digestion and in rendering the food more appetising, and so improves the general health. Thus, as with everything which improves the general health, it increases the animal's power of resistance to the effects of parasites.

### Horse Foodstuffs.

The preceding remarks on the general principles of horse-feeding may be usefully considered in conjunction with the following brief notes on the chief materials used as food in this State.

*Oats.*—The best of all grains for use in feeding horses, and not sufficiently appreciated in this country—a very safe grain to feed, as the amount of hull on the grain prevents overgorging and massing in the stomach. Especially useful for horses on hard and fast work. The various food constituents are very well balanced in oats.

*Maize* (*Corn*).—A very valuable horse-feed, but the food constituents are not so well balanced as in oats, and better results are obtained if maize is fed with the addition of some bran, linseed meal, or hay, or chaff made from legumes such as clover or lucerne to supply the deficiencies. Providing the ration is otherwise satisfactory, maize is as good as oats for the average working horse, but not so good as oats for young growing animals.

*Wheat.*—An unsatisfactory grain to feed to horses on account of the danger of engorgement and its tendency to form a pasty mass. Unlike oats, it should always be fed mixed up in chaff to prevent trouble, and horses which have not been accustomed to wheat should be brought on to it carefully. Its nutritive value is high, but it is not so well balanced as oats.

*Barley.*—Not much used in this State, but a good horse-feed, especially if lightly crushed and fed with bran and chaff. It can replace oats or maize if the ration is otherwise balanced.

*Chaff.*—Oaten or wheaten chaff is the bulk food most used in this country, and is likely to remain so. Its value varies very greatly (as before mentioned), but when of good quality it is doubtful if any bulk food is superior to it in food value, handiness, economy and suitability for average working horses. Feeding exclusively on chaff of low quality has its drawbacks.

*Bran.*—A very excellent food for working horses in moderate quantities. Its value is not solely to be judged by its chemical analysis, which does not do it full justice. It has a mild laxative effect, supplies various salts much needed by growing animals, is very useful for sick animals, and can be utilised to balance rations poor in protein and mineral salts.

*Lucerne* (*hay and chaff*).—Not considered a very satisfactory sole bulk food for horses, but very nitrogenous; it will greatly increase the food

value of a ration which is poor in such constituents, and will improve a diet which is principally of oaten or wheaten chaff, if added in moderate quantities.

*Hay (grass or clover).*—Both forms are valuable foods, clover being of most use in conjunction with a diet low in nitrogenous matter. Good grass hay and oats give a nearly perfectly balanced ration.

*Linseed Meal.*—Both this and other similar meals can be fed to horses in quantities of up to 2lb. daily, and can replace about twice the quantity of bran so far as ordinary food material goes. If too much is fed it is simply wasted, being passed through unassimilated.

*Straw.*—For horses which are not being worked, straw can be quite usefully employed as feed, especially if made palatable with molasses, which will also increase its food value. A judicious admixture of chaff and chaffed straw may also be utilised for horses doing easy work, and it is in fact widely used. It must be remembered that the mastication and digestion of straw requires a good deal of energy on the part of the animal. Oaten and barley straw are the best.

*Molasses.*—Of much value in making such feeds as straw, &c., palatable to horses, in increasing the carbohydrates contained in the food, and in acting as a mild laxative.

Many other materials can be utilised as horse-feed, and the adaptability of the horse to different fodders is remarkable, particularly if he is brought on to them gradually and fed on them regularly. Whatever the feed selected, care must be taken that the quality is good. Musty and mouldy food, new grain, dusty hay and chaff, and inferior food of all kinds are liable to lead to trouble.

### Diseases Associated with Feeding.

Of the diseases associated with feeding in the horse, the most important is, of course, colic in one or other of its numerous forms; and among others may be noted azoturia, forage poisoning, laminitis and lymphangitis.

*Colic.*—The commonest causes of this complaint are errors in the quantities of food given and the size of the feeds. Sudden changes of food (particularly that from grass to grain), heavy feeding immediately before hard work, the bolting of quantities of indigestible grain, such as wheat, and the ingestion of large quantities of fibrous matter, such as the running stems of the paddy-melon (*Cucumis myriocarpus*)—all these are liable to cause colic in strong, well-conditioned horses, and there are also other causes likely to operate in animals debilitated through a continuous low ration or temporarily exhausted from excessive strain. The administration of even an ordinary grain food will at times cause trouble in these cases, and the giving of an extra large feed to a tired or exhausted animal may lead to serious results.

In cases of debility the tone of the digestive organs is so low that large quantities of concentrated food cannot be dealt with, and indigestion and colic result. Debilitated animals are also peculiarly prone to flatulent colic if food of a highly succulent and fermentative nature is given. Weak and

exhausted animals should, above all others, receive small feeds at comparatively short intervals. They should also be worked with care, as it is in animals in that condition that colic is especially apt to be associated with watering. On the other hand, the danger of giving water to a warm horse has been much overestimated.

In many cases where improper feeding may not lead to attacks of colic it will induce a more or less serious indigestion—at times acute, and at others chronic—which is shown in a failure on the part of the animal properly to digest his food, and a consequent unthriftiness. In such cases the first step should be to investigate the methods and materials used in feeding and to correct any errors noted. This should always be done before resort is made to medicine, which will in many cases be then found unnecessary.

*Azoturia.*—The ill results of maintaining a resting horse on the same high ration on which he has recently been working are seen in those cases of azoturia which occur frequently in cities and which seem to be due to the overloading of the resting system with a rich diet, and the sudden disturbance of metabolism involved in the change from work to leisure. An appropriate reduction of the diet and the provision of a laxative food such as a bran mash on the day before a holiday, will to a fair extent prevent such cases.

*Forage Poisoning.*—Mortality from this cause is nearly always associated with a supply of mouldy or dirty food, and can be largely prevented by assuring that such material is not used.

*Laminitis.*—Overgorging with wheat is often followed by this disease, but it is not likely to occur if the wheat is properly fed and the horses are not put on to it too suddenly.

*Lymphangitis.*—A complaint frequently seen in horses kept on full feed during rest days immediately following days of hard work. Under such circumstances the richness of the diet should be lowered before the rest.

(*To be continued.*)

## PURCHASING QUEEN BEES.

IT has been noted that in some cases apiarists who have a poor breed of bees, and who are preparing to improve the standard by Italianising, in the first instance purchase a high-priced, selected tested queen from a queen-raising apiary. I would advise in such cases that a number of untested queens be purchased in the first instance; then, when the strain has been improved sufficiently to give a good chance for pure mating, the apiarist could, if desired, purchase a selected tested queen.

A selected tested queen is usually a good age when purchased, and the best use must be made of her as a breeder as soon as possible. A good practice, if it is desired to procure a tested queen at once, is to purchase such a queen along with a number of untested ones, and breed from the tested queen until the general standard has been improved.—W. A. GOODACRE, Senior Apiary Inspector.

# Strawberry Culture around Sydney.

L. GALLARD, Fruit Inspector.

Of the side-crops grown by orchardists there is none (providing conditions are favourable) which gives better returns for the amount of time and money expended on it than the strawberry. That only a small area is required for the cultivation of the crop should add to its popularity—a quarter of an acre of strawberries well cared for will often yield over £60 in one year. To obtain such a return a good deal of attention is naturally called for, but the work is light and can be performed by women as well as (and often better than) men. Thus the thrifty wife and the younger members of the household can often substantially add to the family income.

The first two essentials for the profitable cultivation of strawberries are (1) a good water supply, and (2) ready means of access to market; a north-easterly aspect is desirable, and a sandy loam with a clayey subsoil is the soil most suitable, but both of these points are quite secondary in importance compared with water supply. I have seen really good beds of strawberries even in land with a westerly aspect, though it is wise to pick a slope which will catch as much of the morning sun as possible. As for soil, if sandy loam is available certainly choose it. Such a soil produces the brightest coloured berries, gives the best root service—thus enabling the plants to assimilate all the nutriment put into the land—and is much more easily worked. Black soil will grow plants all right, and in many cases will do with less artificial manure, but it sets down very hard after watering, and is difficult to work, while the berries grown on it are darker than those grown on sandy loam, and lack their lustre.

Newly cleared bush land is preferable if it can be procured—such land does not produce many weeds, and does not need so much manure—but the prospective grower who cannot procure just the sort of land he wishes need not be discouraged so long as he has the water supply. If his soil is not just suitable, he can loosen it by dressings of stable manure or bush rakings; or strengthen it with fertilisers, provided he has the water to enable him to get the good out of the fertilisers at the right time. Without the water, fertilisers are uncertain in their effect.

Strawberries can be grown profitably almost anywhere between Sydney and Hornsby, provided the land chosen is not so far back from the railway as to make marketing inconvenient. From North Ryde to Epping is a very popular district on account of its city water supply and its proximity to market. Growers in this district can pick their strawberries every day, and run them into the market in the morning on their own carts, quite fresh and sound. This gives them a decided advantage over others who are situated at greater distances from the city.

### Preparation of the Land.

The land should be ploughed or dug up from 8 to 10 inches deep and harrowed down well. A dressing of about 1 ton to the acre of blood and bone (or, better still if available, its equivalent—about 30 tons—of stable manure) should then be spread over the surface and ploughed or dug in. If blood and bone is used a very good plan is to sow the manure in every third furrow and bury it that way. If an 8-inch furrow is made the fertiliser will be brought immediately beneath where the row of plants will subsequently come. This method buries the manure deeper and reduces the production of weeds. The working should be done a few weeks before planting time if possible. If the manure has not been worked in previously, and is being applied when planting, care should be taken not to bring it into direct contact with the roots of the plants, as it may produce scalding.

### Method of Planting.

Two methods of planting are in vogue in the Ryde and Pennant Hills district—the single and the matted row methods. The single row is the more popular, but some growers contend that the matted row (see Fig. 1) provides more shelter for the berries.

When planting in single rows, the rows should be about 2 feet apart, and the plants set about 10 inches apart in the rows.

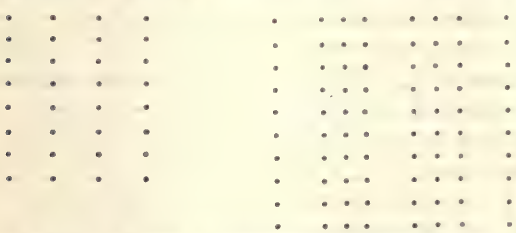


**Fig. 1.—The single and matted row methods of planting.**

When a matted row is needed, all that is required is either to go through the bed after it has been planted as just stated and plant another row in every second space, or to wait until the runners begin to spread, and leave such new plants as are evenly spaced between every second pair of rows. When these are well rooted, the runners between the main plants and the new ones may be cut, and the latter allowed to establish themselves.

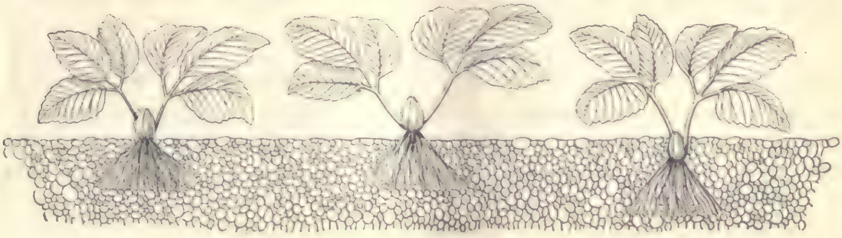
If a grower determines from the start to have matted rows, the three rows to form the matted one are best planted 10 inches apart, and an extra width of 4 inches allowed for an alley or path row. These measurements allow sufficient room for the pickers and for the cultivator to be run through in off seasons.

The number of plants required for an acre, if planted 2 feet by 1 foot, would be 21,780; if 2 feet by 10 inches, 26,136. If matted rows are planted, the number of plants needed will be increased by one half.

### How to Plant.

For planting, choose only good healthy runners with a good root service. If the roots are too long, cut them back to about 3 inches. If the ground is in good tilth, a hole sufficiently large for the plant can be hooked out by hand or with a small scoop; otherwise a small drill can be made. Spread

the roots a little when planting so that the root service may be evenly divided all around the plant, and leave the crown of the plant just above the ground level. When the plants are set, press the soil in round them fairly firm.



1 2 3

**Fig. 2.—No. 1 is correctly planted, No. 2 is too high, and No. 3 too low.**

A line should be used when planting, as straight rows not only look well but are essential if a horse is to be used amongst them or surface irrigation practised.

### Time for Planting.

May is the most popular planting time in the district under discussion. Planted in this month, the plants have a chance to get well set ready for the main crop, but they can be planted up to the end of July, and if the winter is severe this late planting often gives the best results.

**Fig. 3.—The line shows where the roots should be cut off.**

If a grower has a piece of land upon which he is not likely to have too many weeds, a planting in February will give an extra well established plant for the main crop, and one which, without being injured for the main crop, will meantime carry a few early berries. To obtain such a result, it is necessary to leave the first runners which come out while the second crop is maturing, and thus

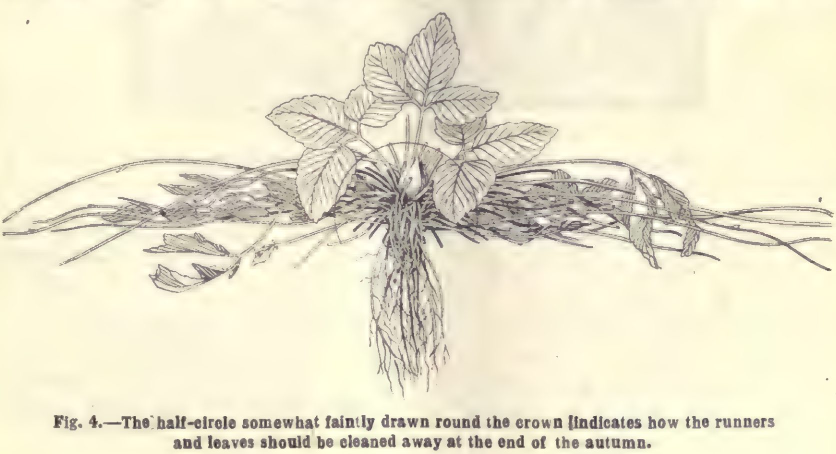


**Fig. 4.—The half-circle somewhat faintly drawn round the crown indicates how the runners and leaves should be cleaned away at the end of the autumn.**

suffer loss in connection with that crop, as only the two first runners can be used for this planting. The practice is not very general in the Ryde district, as growers claim that the benefits derived do not compensate for the sacrifice made in other directions.

### Varieties to Plant.

In this district Creswell's Seedling has been a favourite for many years on account of its bearing qualities. This variety often yields almost as good a second crop as the first, and, under good conditions, will often yield other fairly good off-crops. At the end of June, 1920, one bed in North Ryde was yielding a very nice picking. It was on this plot that the photograph reproduced was obtained. The berries in this variety are bright red, elongate, and often flattened on the sides. Its main fault is that it is a little soft in texture, but in spite of this no other variety has yet been able to displace it.

**Fig. 5.—Bed of strawberries bearing fruit.**

**This photograph was taken in June, 1920, and the punnet of strawberries inset was actually picked from the bed in that month.**

Glenfield and Melba are two good varieties, and Dr. Moree is also considered a fair one. As an early variety, Improved Malakoff is well worth a place, as it ripens much earlier than Creswell. It throws a heavy main crop, but is not nearly so prolific in the second crop as Creswell; its flavour is richer, but its colour is rather too dark. The plant carries a very heavy foliage, and is very prolific in runners. Phenomenal is also worth a place in small gardens on account of its flavour, but the berry is too small for commercial purposes.

### Time of Ripening.

As soon as the plants begin to grow they throw out a few early blossoms, which ripen and give an early picking in September. The proper main crop of Creswell in this district, however, usually starts about the first week in October, and lasts for three or four weeks. After this comes a break of three or four weeks, then the second crop starts, and runs for a similar term. After this, if the plants are kept free from runners and are well cared for, they will throw another light off-crop in the autumn, which will run on, if the winter is mild, until the end of June. Even where the runners are left, if the season is favourable, they will throw a good few berries.

### Mulching.

As soon as the plants begin to blossom they should be surrounded by mulching of some kind, to prevent the berries from being splashed with dirt during rain or when watering. Bush rakings are best for this purpose, as they make a good mulch for the first year, and can be worked in as manure the next. Where leaves cannot be obtained other forms of mulch may be used, such as straw, stable manure from stables where straw has been used for bedding, blady grass (either long or chopped up into coarse chaff), &c.

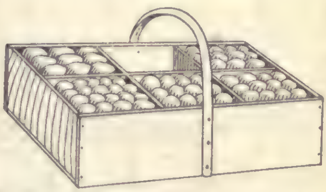


Fig. 6.—Picking box, with punnets in place, into which the fruit is graded as it is picked.

While the plants are blossoming and the berries are growing care should be taken to keep the bed free from weeds. Toward the end of the season, when the runners have spread all over the ground, this is a task of some magnitude, and it is quite a common occurrence to see good beds so overgrown with summer grass that the plants cannot be noticed from a distance of a few rods away. Where this has happened, and where runners are being saved for planting or sale in the following year, the business of cleaning up is best deferred until the runners are dug.

### Cropping.

The warmth of our climate enables us to get two good crops in the year from some of our most prolific varieties of strawberry, and in favourable seasons an additional early and late off-crop may often be harvested. The prices are always good for the latter, and this fact tempts growers to try to produce them, but it is questionable whether the benefit derived from their sale is worth the loss of vigour which the plants will have suffered by the time they are called on to produce good main and second crops, except in an unusually good season, when there is an excess of moisture, or where the grower is going in for strawberries only and can practise intensive cultivation. In such a case, where the grower has a reliable water supply, and can put in the whole of his time among his strawberries, he can produce—by careful treatment—very good off-crops without interfering much with the main and second crops. Several growers in the district mentioned claim to have

marketed Creswell's Seedling for over seven months in the year under these conditions. The earlier remarks apply to cases where strawberries are grown as an orchard side crop, and chiefly to the first year's growth.

### How to Treat Runners.

The plants should be kept free from runners till after Christmas time. After that, if plants are required for the next season, they may be left and allowed to root all over the plot. By this procedure a grower with half an acre may often add another £20 to his income through the sale of plants. These plants are generally sold at from 18s. to 22s. 6d. a thousand.

When the plants are blossoming for the second crop they throw out long forked arms, upon which the fruit is produced in bunches. It is at this time that the plants begin to bear the greatest number of runners, and consequently the grower has a busy time cutting them off so as to give the berries a chance to attain a good size.

### Time and Method of Harvesting.

As soon as the plants begin to blossom the grower should seize the first opportunity of getting in a good supply of punnets, as there is nothing that will give him so much anxiety and cause him so much inconvenience as to have a fine lot of berries ripening and have no punnets to market them in. It is here also that the most skilful part of the business comes in. Commercial success depends greatly on how the crop is handled. The berries should not be allowed to get too ripe, and when they are at their best the plots will need going over almost every day if the crop is to be kept in hand.

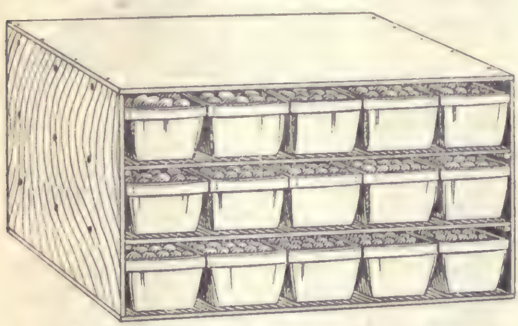


Fig. 7.—Packing box, to carry forty-five punnets.

Strawberries should be pinched off with some stalk attached and handled carefully. Receptacles which do not hold too great a quantity should be used for picking into, as it is essential that the berries should not be subjected to any more pressure than necessary. Some growers use soup or large dinner plates. These are good on account of the smooth surface, which does not cut or chafe the berries; but they are a little inconvenient and heavy. Others use punnets. When inexperienced hands are picking, the receptacles should be carried to the packing shed when filled and handed over to persons more qualified to grade and pack their contents. When experienced hands are doing all the work, and a receptacle is used which will carry a number of punnets, the grading can be done at the same time as the picking. A very good picking receptacle can be made by putting a handle on an ordinary oblong box of sufficient capacity to hold six or more punnets, as shown in

Fig. 6. This can be moved along in front of the picker, who places the different sized berries in separate punnets. If this is done carefully, all that is necessary when they are carried to the packing shed is to carefully arrange the top row to give it an even and attractive appearance.

Care should be taken to keep the berries of an even grade all through, so that the grower's brand is sufficient guarantee to the buyer, as there is no fruit which suffers so much from being pulled about by intending purchasers as the strawberry. Another advantage of honest packing is its assurance of quick sales—an important point with such tender fruits. The crop may be divided into three grades. All damaged berries, and those too small or deformed to be classed as third grade, should be put aside. After packing is finished, the stalks can be picked off these berries, which should then be placed in kerosene tins, to be sold to jam makers by the pound. In seasons when prices are low, third grade berries may be treated in the same way.

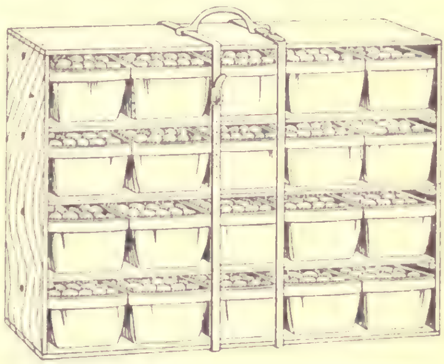


Fig. 8.—Carrying box, containing twenty punnets.

If the punnets are to be packed in an ordinary box and merely separated from each other by a piece of thin board or cardboard, the berries must be packed just below the edge of the punnet. This method does not show the fruit to best advantage, and consequently most growers make special carrying boxes, so designed as to allow the berries to be packed a little over the top of the punnets. These boxes are made by nailing narrow strips across the ends so that two horizontal divisions of thin board may be slid in. The depth allowed between these divisions is such that the punnets may rest on them without the surface of the fruit touching the board above (see Fig. 7). Silver Star starch boxes are useful in this connection, being of the exact size to carry forty-five punnets.

When a grower is situated close to a railway station and has only a few punnets of off-crop berries to dispose of, a narrow bushel packing case can be used to good advantage. Two of these, fitted with divisions as described, and carefully packed, as shown in Fig. 8, can then be bound with straps and carried either one in each hand or (strapped together) over the shoulder. With the aid of such cases the grower can carry three or four dozen punnets to the station, board the passenger train, and land his goods in the market in good time and in first-class order.

Nearly all our strawberries are now sold in chip baskets or punnets. These are of different capacities—the pint, the pound, and the quart. The pint and the pound sizes are generally used for the best qualities, and usually bring the same price as the quart size.

*(To be continued.)*

# Spring Work for the Banana Grower.

W. J. ALLEN and REG. G. BARTLETT.

### The Selection of Suckers for Planting.

ONE of the most important points in the growing of bananas is the selection and proper treatment of suckers for planting. Unfortunately it is a factor to which very little attention is given by the majority of growers. One hears a good deal about the selection of seed maize and the grading of seed wheat, and of the increased returns and general improvement that arise therefrom, but one does not meet many banana growers who recognise the close relation that careful selection of suckers bears to the future life of a plantation, not alone in regard to the yield of fruit, but particularly as to freedom from disease.

Too often we see suckers taken from abandoned plantations for the simple but very unsatisfactory reason that they are cheap and easy to dig out. The grower knows nothing of the history of such a plantation, nor why it has been unprofitable and has had to be abandoned. A case in point occurred quite recently. A plantation had been abandoned nominally because it had become infected with bunchy top, but when examined it was found that the suckers were positively riddled by beetle borer. An unsuspecting grower might conceivably have decided to select suckers from such a plantation by taking plants that bore no signs of bunchy top, but he would undoubtedly have introduced beetle borer into his new plantation. The intending grower should know not only that his suckers are free from disease and pests but that they come from clean plantations.

It can be readily understood that in the early days of the industry, when the supply of available suckers was scanty, growers had to take what they could get, and the unsound practice arose of planting anything and everything in the shape of a sucker—even to splitting up old butts into four and sometimes six "slips." In many instances—it is hardly too much say, in nearly every one seen—bunchy top has developed on plants raised from butts split into small parts, perhaps because of the extent of cut surface exposed by this method to the action of fungi and bacteria in the soil. Growers will do well to take warning and pay careful attention to this important matter of selecting the right class of sucker.

### Selection for Vigour.

Most growers know that the most vigorous sucker is the one with a good bulb and with small narrow leaves. This type of sucker is always a good grower and always produces a good bunch of fruit. The size of the sucker is of less importance than the size of the bulb. The bulb is simply food stored up; hence the larger the bulb the larger the quantity of food stored up to

tide the plant over the shock of removal and to enable it to put forth roots in its new abode. Suckers with poor bulbs and trunks of uniform girth should be rejected, and those with good bulbs and tapering trunks, or as some describe them "bottle-shaped," should be preferred. In this way vigorous plants will be obtained that will make the best of the soil and weather conditions.

One of the most vigorous plants of all, of course, is produced from the old butt from which all but one or two eyes have been pruned away. This gives the young plant plenty of food, and enables it to overtake larger suckers and to produce a larger and better bunch, and at a time when prices are good. Let it be repeated, however—do not split your butts into small pieces making four or six sets or slips, for how then can you get vigour, and how can the plant resist the intrusion of disease with such an extensive cut surface?

### Selection for Disease Resistance.

If the suggestions made above are adopted the grower will plant few diseased bulbs. There is still a chance, however, that suckers will be planted that are not free from root disease, for once introduced into a plantation it can never be eradicated. The grower requires to be extremely careful, therefore, that he does not permit it to come into new areas with his plants. Fortunately its presence in a sucker can be readily discerned by examining the butt. If the butt is cut across with a sharp knife reddish pin spots will be noticed—an unfailing indication of the presence of root disease. Sometimes, if the disease is very marked, it will be found that the rot of the roots has extended fully half an inch into the bulb itself. If, therefore, these symptoms are found in any of the suckers in a field, all suckers in that field should be rejected for the purposes of planting a new area.

Again, beetle borer may be present in a plantation. All suckers intended for planting should be examined to discover whether they show any sign of a hole—in fact, thin slices may be removed from the outside of the bulbs, and if holes are found with material resembling sawdust in them it may reasonably be supposed that the borer is present, and that no plants from the plantation should be used in setting out a new area; at any rate, an officer of the Department should be asked to make an examination.

Nematodes are the curse of plantations not on basaltic soils. They manifest themselves by gall-like swellings or nodules on the roots and by red discolorations that are seen when the roots are split along the length. If these pests are present all suckers should be carefully freed from soil and all roots absolutely pruned off to the bulb. The bulbs should then be soaked for at least two hours in a solution of corrosive sublimate. The strength of the solution should be 1 to 1,000—or 1 ounce corrosive sublimate to $6\frac{1}{4}$ gallons of water—and it should be contained in a wooden vessel. The mixture is cheap (the corrosive sublimate is about 1s. per ounce) and it may be used over and over again so long as there is sufficient fluid left to cover the bulbs properly. As corrosive sublimate is a deadly poison it must be handled with care, and troughs containing the solution must be covered. No harm

is done to the suckers if they remain much longer than the two hours in the solution. Indeed, a grower may dig the holes for a batch of suckers while soaking, and then remove and plant them while the next batch is soaking in its turn, even so long as overnight for next morning's planting.

### Planting Suckers too Close.

One of the common errors of banana growers in this State is to plant too close. In Queensland the distance apart that is generally accepted is 12 feet by 12 feet—a method that allows of a citrus orchard being established on the same ground at the same time, with the trees 24 feet by 24 feet apart. Under the conditions obtaining in this State, however, the districts in which bananas are grown have not so far proved suitable for citrus, and this has permitted the space to be reduced appreciably. The system of leasehold tenure has acted in the same direction, it being necessary for the tenant to get as much as possible out of his ground during the short currency of his lease. Moreover, close planting means less weeding, and consequently less expense in cultivation, for the leaves cover the ground, shutting out the light and smothering the weeds.

The grower must take into account, on the other hand, the fact that close planting tends to make the plant grow abnormally tall and to become brittle, with the result that the bunches drop off before they have matured. Further, too dense a shade during humid spring weather favours the development of fungus troubles of different kinds, such, for instance, as "cigar-end," a diseased condition that is more prevalent here than in Queensland.

On the whole, 11 feet by 11 feet may be considered a happy medium in New South Wales; 10 feet by 12 feet gives greater convenience, perhaps, in cultivation where horse implements can be used.

To the care exercised by Queensland growers in the establishment of their plantations must be attributed the long life that is common there; cases are well known in that State of plantations twenty to thirty years old that are still productive, though never replanted. There is no reason why, with good cultivation and attention, they should not live to a good age here also.

### Depth of Planting.

Many mistakes have been made in this important matter. The grower should recognise that the habit of the banana is to send out roots at a uniform depth of 3 inches below the soil level. This is a fact the importance of which has to be recognised. Whether the bulb is large or small, whether it has been planted deep or shallow, its natural tendency is to throw out its roots at that depth. Its significance lies just here—the grower should plant his suckers with only 3 inches of soil above the top of the bulb. In other words, a sucker with a 3-inch bulb will be planted 6 inches deep, and one with a 12-inch bulb will be planted 15 inches deep. Where obedience to this method means that the hole cannot be filled in it should be "dished off," so that it may be filled in gradually by cultivation, rain, &c., after the roots have developed at the right point.

It must not be concluded from this that shallow holes should be dug for small bulbs. In every case the hole should be at least 15 inches deep, and the bottom should in addition be broken up with a pick or mattock. The bulb is then set on this loose bottom, a few inches of soil being thrown in in the case of small bulbs; the soil is finally filled in over the bulb so as to give the 3-inch covering referred to.

The importance of this will be seen if we point out the effect of planting too deep. It has been observed often, that if a sucker is set too deep, instead of rooting from the bulb (the natural place) it sends out roots from the stem by splitting the trunk at 3 inches below the surface, and forming a sort of false bulb at that level, while a constriction develops below which makes it impossible for the plant to utilise the plant food stored in the proper bulb. This, of course, means that the sucker is at a standstill until such time as the false bulb and roots have developed, which involves serious loss of time during the growing season and results in a plant distinctly weaker than it might have been.

We cannot too strongly stress the care that should be exercised in planting the top of the bulb at no greater depth than 3 inches below the soil level. Sometimes it is even necessary after a severe rainstorm to go round and remove some of the soil that has been washed in, covering the bulb to a greater depth than the correct one.

### Pruning or Suckering the Banana Plant.

Pruning—or suckering, as it might just as well be called—is neglected by some, and imperfectly understood and practised by others. Some growers are content to give little attention to it, while others either do it to excess or at the wrong time.

Pruning is carried out for three principal reasons:—

1. It conserves plant food.
2. It results in larger branches and better fruit.
3. It ensures fruit when prices are high.

The removal of such suckers as are not required to produce the crop of fruit is necessary, and should be done when the suckers are not more than 1 foot high. The larger the sucker grows the more food it takes from the parent bulb, and the more do its young roots interfere with the roots of the parent sucker, a reduction in the size of the bunch of fruit being the ultimate result.

It has been proved often enough that the more suckers there are to a stool, the smaller will be the size of the bunches, and the longer will it take for the suckers to mature fruit. The reason is palpable—the suckers are competing with the mother plant for plant food in the soil, and are actually partly fed by it.

The influence upon the price obtained from the fruit is even more interesting. Growers generally are content to market their crop every month and any month in the year, without much attempt to regulate the bearing season. It will be admitted, however, that the height of the summer—the

end of December and the whole of January and February—are the least profitable months of the year for bananas. If a pruning method can be adopted that will bring along a larger crop in the better months of the year it will obviously be in growers' interests.

If pruning is to be carried out to the best advantage it must not be earlier than January or February. It is a grievous and expensive mistake to do the work earlier in the spring. No doubt it looks reasonable, at a time when the suckers are drawing heavily on the plants, to reduce their number, but as a matter of fact the plant is then in such a vigorous condition that the effect of pruning is to force out an extra growth of suckers, with the result that more labour than ever becomes necessary later in the summer to cut these out. Had the pruning or suckering been delayed until January or February no further suckers would have developed, and one pruning would have sufficed.

Great care should be taken when pruning not to injure the mother plant or its roots, and to this end the spud-bar should be forced only half way through the bulb of the sucker that is to be taken out, and then a gentle levering action will break it off without damaging the parent plant. The hoe and the mattock are not recommended for the operation, owing to the damage they cause to the main root system. Moreover, the remaining portions of suckers so removed are likely to grow again and thus make double work.

A handy and effective tool for the purpose can be made by any blacksmith out of round $\frac{7}{8}$ inch iron, 4 feet long; a blade 8 inches long and 2 inches wide is drawn out at one end, and a 4-inch diamond point at the other end.

Surplus suckers may be most effectively dealt with by cutting off close to the ground with a sheath knife and piercing the centre of the stump with the point of a knife, gouging out the heart. Fluid collects in the hole and prevents further growth without any other injury to the plant. This, of course, only applies when the suckers removed are not required for planting.

It is generally found most profitable to have only three main suckers forming a stool, with three "followers" (small suckers) to take their places. As each parent sucker in an established field will produce from three to five suckers, choice must be made as to which shall be left as the "follower," and it is there that individual judgment is necessary. As a general rule the following kinds of suckers should always be taken out, because none of them will produce a large bunch:—(1) Those situated inside the triangle formed by the original suckers of the stool; (2) those with broad, flat leaves, often called umbrella or water suckers; (3) those small ones, 4 to 12 inches long, to be found on stumps.

In selecting the suckers to be retained, preference should be given the following:—(1) The sucker with the largest bulb; (2) the sucker farthest from the parent (this ensures room for development); (3) the most pointed sucker with narrow leaves—always a vigorous type of sucker.

The stool should be encouraged rather to spread along the row than between the rows, so that space may be maintained for inter-cultivation with horse implements.

### The Leaves to Remove.

As the first leaves decay they hang down all round the plant, but they should not be removed during the winter as they afford the plant protection from cold. If carefully cut away at the end of August the sun is better able to get at the trunks and to promote more rapid growth. Too much shade in the growing season is apt to make the stems lengthen out and become brittle. Some growers are too zealous in removing these leaves, however, for they not only cut off dead leaves, but they also remove green leaves, thereby depriving the plant of part of its own machinery for the elaboration of the plant food obtained from the soil. It is safest only to remove those leaves that are actually dead.

Old suckers, from which the branches were removed some little time back and which were allowed to remain as protection for the stools during the winter, may also be got rid of as the weather becomes milder (say the end of August), providing the leaves are quite dead. This can be done with the tool already described. The blade is driven horizontally into the old sucker close to the ground at its junction with the bulb, and is then used as a lever while the head of the sucker is simultaneously pushed over with the left hand. The operation only takes a few seconds, once a little practice has taught the operator just where to drive in the bar.

### Deep Cultivation.

The first year of cultivation is the most critical, and entails the heaviest work. Keeping down weeds, maintaining the surface mulch, and loosening the soil, are all important in the cultivation of bananas. Owing to the nature of New South Wales plantations, which, in the majority of cases, are on steep, stony hillsides—to get above frost level—ordinary methods of cultivation are unsuitable. Still, it cannot be too strongly emphasised that deep cultivation is necessary at the right time, with modifications according to the conditions.

In the spring all plantations should, where possible, have the soil deeply loosened, either by deep scarifying or by deep hoeing or mattocking, but this should only be practised when the plants are in vigorous growth—such as occurs after a good rainfall.

The more the soil is loosened and broken up the greater will be the feeding area available for the plants to work on ; and, of course, the roots get a better chance to search for food. Some growers may object to this treatment on the ground that it destroys too many surface roots ; but it has been proved that deep cultivation, in addition to sending roots down to greater depths, also encourages the formation of vigorous feeding roots where the roots have been pruned by hoe or cultivator.

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STUDENTS of soils and plant foods admit that there have never been found materials so generally efficient in maintaining and increasing the crop-producing powers of soils as stable manure.—H. F. THOMPSON, Massachusetts, U.S.A.

# Three New Varieties of Plums.

W. J. ALLEN

Two local seedling plums, Higgins' Seedling, and Wilson's Seedling, have lately been under the observation of the Department; the special features of both are earliness and a constant heavy cropping habit. Owing to their earliness, they have brought good prices on the Sydney market, but, as they are not of high quality and could easily be over-produced, it would be unwise for growers to plant them extensively. They should only be planted in early coastal districts.

Higgins' Seedling, which was forwarded by Mr. Fruit Inspector Stokes, Galston, is a chance seedling raised by Mr. Higgins, Hornsby Valley. It is of cherry plum type, but is a far more reliable cropper, and the owner of the original tree finds it very profitable. Its true value is in its earliness, but Mr. Stokes points out that it is growing under exceptional conditions, viz., in a hot valley in a rich deep soil, and that it may not be so satisfactory on the general run of country in the County of Cumberland. It may be described as follows:—Habit of growth of tree: vigorous and rather more spreading than upright. Fruit: roundish, conical. Suture: not prominent, but discernible half way. Size: small to medium. Cavity: narrow, fairly deep. Stalk: Slender, medium to almost long. Colour: red to dark-red when fully ripe. Flesh: red when fully ripe, firm until ripe. Stone: small, rather flat, almost free when fruit is ripe. Flavour: slightly acid. Cropping habit: heavy. Picking dates for market: from 24th November onward.

Wilson's Seedling (forwarded by Mr. Fruit Inspector Gallard, Epping) is a chance seedling raised by Mr. Wilson, of Eastwood. This plum, too, is of the cherry plum type, but it is a much more reliable cropper. It colours while still firm, and up to the present has proved profitable, as the trees crop heavily. Following is its description:—Habit of growth of tree: vigorous, spurs freely. Fruit: roundish. Suture: not prominent, but showing half way. Size: small to medium. Cavity: narrow, fairly deep. Stalk: slender, short. Colour: dull red on greenish ground, while still quite firm when in marketing condition; ripens after picking to a deep attractive red all over. Flesh: yellow with a stain of red near the skin; firm until ripe. Stone: small, flat, almost free when plum ripe. Flavour: fair, inclined to be acid near the skin. Cropping habit: heavy. Picking dates for market: In 1919, from 24th November to 6th December, which is about a week later than usual.

Another new variety worthy of mention is Tucker's Beauty. This was also submitted by Mr. Gallard, having been imported by the late Mr. Churchill Tucker from Luther Burbank. This plum, says Mr. Gallard, just follows Wilson's Seedling and just precedes Shiro in period of picking. For

that reason it may prove a useful variety on the coast. It showed signs of scald last season. This plum is decidedly of the Japanese type and of better quality than Wilson's or Higgins' Seedling, but it must be remembered that it is later than those varieties. Following is its description:—Habit of growth of tree: very similar to Shiro; spreading, vigorous. Fruit: distinctly conic. Suture: not prominent, but discernible half way. Size: above medium. Cavity: medium as to depth and width. Stalk: short, medium thickness. Colour: a lively and attractive red when ripe. Flesh: juicy and from pink to red when ripe. Stone: roundish in outline, not large, not flat; adheres to flesh. Flavour: not so pronounced as many others of the later Japanese. Cropping habit: not proved yet. Picking dates for market: In 1919, from 6th December, 1919, which is about a week later than usual.

## Pure-seed Growers Recommended by the Department.

The following list of growers of pure seed of different varieties of farm crops is compiled to indicate where pure seed is at present available. The list is compiled on recommendations made after an inspection by a field officer of the Department.

| | |
|---|---|
| *Maize*:— | |
| Silver King (ungraded) | A. Sommerlad, Hillcrest, Tenterfield. |
| Brewer's Yellow Dent | H. Manser, Sunnyside, *via* Tenterfield. |
| Early Yellow Dent (second grade) | Manager, Experiment Farm, Glen Innes. |
| Silvermine | Manager, Experiment Farm, Yanco. |
| Funk's Yellow Dent | A. E. R. Tiffen, Farm 319, Leeton. |
| Small Red Hogan | H. Short, Dorrigo. |
| Craig Mitchell (ungraded) | W. D. K. Humphries, Muswellbrook. |
| Goldmine | A. Louttit, Moruya. |
| Boone County White | J. Chittick, Kangaroo Valley. |
| Golden Beauty | R. Richardson, Mondrook, Tinonee. |
| Leaming | Manager, Experiment Farm, Grafton. |
| Golden Nugget | J. W. Smith, Wauchope. |
| Early Clarence | F. Dowling, Tumut. |
| Giant White | A. McM. Singleton, Henley, Sydney. |
| Improved Yellow Dent | Manager, Experiment Farm, Grafton. |
| Red Hogan | Principal, Hawkesbury A. College, Richmond. |
| *Sweet Corn*:— | |
| Papago | R. Yates, Ourimbah. |
| *Elephant Grass* (roots) | Principal, Hawkesbury A. College, Richmond.<br>Manager, Experiment Farm, Grafton.<br>Manager, Experiment Farm, Lismore.<br>Manager, Experiment Farm, Yanco. |
| *Sudan Grass* | W. Hosking, Farm 778, Leeton. |
| *Kikuyu Grass* (roots) | Principal, Hawkesbury A. College, Richmond. |
| *Grain Sorghums*:— | |
| Feterita | W. Hosking, Farm 778, Leeton. |
| *Sweet or Saccharine Sorghums*:— | |
| Saccaline | Manager, Experiment Farm, Lismore.<br>Principal, Hawkesbury Agricultural College, Richmond. |
| *Clovers*:— | |
| Shearman's Clover (roots) | J. H. Shearman, Fullerton Cove, Stockton, *via* Newcastle. |
| Bokhara or Sweet Clover | A. Sommerlad, Hillcrest, Tenterfield. |

# Poultry Notes.

## October.

JAMES HADLINGTON, Poultry Expert.

By the time these notes are in the hands of readers the last chickens of this season should have been hatched. Rearing will now be at its zenith, and it is still possible for hundreds of thousands of chickens to be ruined or lost by faulty methods. It must again be strongly emphasised that with the present high cost of feeding only good, well-developed birds will pay. The farmer who relies solely on the number of his stock, without regard to their quality, must fail under present conditions. It is more than ever important, therefore, that quality rather than quantity should be aimed at, and constitutional quality is the main consideration in this connection. For instance, however desirable high laying ability may be, if it is obtained at the expense of physique, the wastage that may occur in rearing will probably be more than a set-off to the higher laying capacity of the survivors.

Again, conditions are such that well-grown table birds are now profitable —in fact, almost as profitable as the laying hen. This being so, wastage in rearing is the most serious drawback to the industry—in other words, any well-reared bird is a valuable asset, while badly-reared birds mean losing money and labour in producing them.

### Chicken Troubles.

During the month various chicken troubles have been reported and investigated. Very few cases of serious diseases have come under notice this season, the common troubles being due to faulty brooding, and the most common to running the brooders at low temperatures. A leaflet has been issued by the Department, in which precise instructions and advice on this subject are given and suitable temperatures for different ages are set out, and similar advice is given on page 28 of "Poultry Farming in New South Wales." Notwithstanding all this, persons who have read both publications are found making mistakes in regard to temperature—mistakes which annually cost the lives of many thousands of chickens.

As illustrating this point, cases have been found where week-old chickens, for which a temperature of 90 degrees Fah. should have been available at all times, have only had at times 70 degrees—a shortage of 20 degrees. It should be patent that a range of 20 degrees of temperature in the brooding units is quite sufficient to account for sickness and deaths, yet in some instances it has not even been recognised or imagined that it has anything to do with the trouble. It is safe to assume from experience that fully 90 per cent. of chicken troubles are the result of this neglect or inability on the part

of the operator to maintain proper temperatures, and to thin out the chickens to numbers that have been found to be sound practice in rearing, as advocated in these notes from time to time.

Those who are desirous of seeing thousands of chickens run under good conditions and where good development is being obtained, would do well to visit Hawkesbury Agricultural College during this and the next three months—particularly during this month while there are large numbers of youngsters in the brooders.

### Red Mite.

With the advent of warm spring weather, red mite will become active, and unless prompt measures are taken to exterminate or keep the pest under control, there is likely to be considerable loss in egg production and probably deaths among the birds.

When birds are seen to look anæmic or their combs turn dark, or when, perhaps, a general run down appearance of the whole flock, with a falling off in egg production is noticed, red mite may be suspected. The perches should be examined—particularly underneath and under the ends that rest upon cleats—when small red insects will often be found in such numbers as to give them the appearance of a semi-liquid substance falling to the floor. These are the suckers, full of the blood that they have extracted from the hen during the previous night. In addition to these visible signs of blood suckers there may be swarms of small grey insects. These are the same insects but in a different stage. In this stage they will be found in almost any part of the poultry house nests and, in bad infestations, even up in the rafters of the building. The cast skins and excreta will be present in the form of white masses at the entrance, or about cracks and crevices of the woodwork.

There are two ways effectually to rid the poultry houses of this pest —(1), by spraying the houses with kerosene emulsion, and (2), by painting roosts, &c., with blue oil or wood preserving oil, sometimes known as crude kerosene or kerosene tar.

### How to make the Emulsion.

To make kerosene emulsion, bring to boiling point 1 gallon of soft water and dissolve in it 8 ounces of soft soap; remove from the fire and add slowly 1 gallon of kerosene, stir briskly for ten minutes or more until the oil is thoroughly incorporated with the soap water, and appears like thick cream; then add this mixture slowly to 10 gallons of soft water, stirring all the time. Smaller quantities can, of course, be made in the same way.

Rain water stored in tanks, water from the metropolitan water supply, that from most water-holes, and river water in general, is suitable for making kerosene emulsion, but brackish and hard waters are not suitable for the purpose.

If a quart of wood preserving oil (often know among poultrymen as "kerosene tar") is added to the emulsion in place of a quart of kerosene it will be found more effective, but the objection to the use of the wood-preserving oil is its tendency to soil the feathers of white fowls.

### Spraying the Poultry Houses.

To do this work properly, a good force-pump with hose (such as is used by orchardists) is necessary, so that every crack and crevice in the fowl-house can be reached with the kerosene emulsion. Where the infestation is bad, two, three, or even more sprayings will be necessary. One spraying is of little or no use. The sprayings should be given with an interval of a day or two between each, so that any mites that may have been missed by the first spray may gradually all be exterminated. When these spraying operations are thoroughly understood they involve less time than would appear at first sight.

# Orchard Notes.

## October.

W. J. ALLEN and W. LE GAY BRERETON.

The preservation of moisture in the soil by thorough cultivation is one of the main cares of the orchardist during the summer months. Generally at the present season the cultivator, either rigid or spring-tooth, is sufficient to loosen the ground and put it in good condition, but should the trampling from spraying after rain be excessive then it may be necessary to resort to the plough. If possible, it is better to reserve the use of the plough till later, when the bulk of the spraying is through for the season. Moreover, in our tableland and coastal districts it is often necessary to use the plough later in the season, repeated showers having prevented lighter implements from being used on the land until the weeds have become too big to be dealt with by anything else.

Any part of the land near the tree that cannot be reached by the plough or cultivator should be broken up and kept free of weeds by means of either pronged or flat hoe.

Newly-planted trees require special attention in this way, and should a dry spell set in, it should be remembered that the roots of such trees are not fully established, and it may be necessary to open up round them and apply from 4 to 8 gallons of water. After the water has soaked away, the hole should be filled in with dry soil to prevent evaporation.

Land on slopes that has been brought into good order by the cultivator is unfortunately easily washed by heavy falls of rain. Where these are likely to occur, open furrows should be made frequently to prevent the water accumulating at any point until it breaks through, carrying the loose soil with it. Care should be taken that such open furrows have not too steep a grade, or they will wash into big channels ; at the same time, if of insufficient grade or badly located, they will not carry the water through minor depressions, and the trouble is only aggravated thereby.

## Spraying.

Though some of the early blossoming varieties of apples and pears—especially on the coast—may have required attention before this, the bulk of the apples and pears will only be ready for their first or calyx application of lead arsenate early this month. The idea of this application is to lodge some of this poison in the calyx, and the nozzle-man should remember this, moving his nozzle systematically along each branch of the tree, and also turning it so that the spray hits the open calyx direct.

If this season is wet, lime-sulphur at summer strength for apples and pears should be combined with the first lead arsenate spray, in districts where black spot of apple and pear are prevalent. It should also be noted that lime-sulphur should not be used as a summer spray on Trevitt apples nor on Williams pears *on the coast.* Bordeaux mixture may be used instead of lime-sulphur in conjunction with lead arsenate, though it will cause more or less russetting of the fruit. Williams pears grown on the tablelands stand summer applications of lime-sulphur.

In making the later applications of lead arsenate, following the first or calyx application, it is often found that the spray dries in beads instead of forming a protective film over the surface of the apple. The experiment of soap as a spreader was again tested on an extensive scale by the orchardist at Bathurst Experiment Farm, and again showed superior protection from codlin moth, and caused no injury either to fruit or foliage. The mixture used at Bathurst Experiment Farm was as follows:—4 lb. lead arsenate, 8 lb. soft soap, ½ pint concentrated nicotine extract, 80 gallons of water.

Equally good results were obtained when 6 lb. of hard soap were used in place of 8 lb. of soft soap. As it has been proved in the laboratory that soap added to a lead arsenate mixture causes a reaction, setting arsenic free, the soap should for safety be dissolved in a portion of the 80 gallons of water and added while the agitator is working and just before the spray is to be used. The mixture should be used at once, and not held for any length of time.

Where peach aphis is showing, spray with tobacco wash (home-made) or one of the commercial extracts. The spray should be applied at high pressure, and lavishly, holding the nozzle close up to the parts affected, and if within two or three days after first application any aphis remain alive, repeat the operation. This is most important, as the aphis breeds very quickly, and if the second spray is not repeated within two or three days they will breed up as quickly as they are killed and never be got under.

Where black-spot of the vine is prevalent, and if the weather is favourable, spraying should be carried out as directed in these notes last month. Sulphuring should also be carried out for oidium.

Watch for early signs of the pear and cherry tree slug. If detected early, the cherry trees can be sprayed with lead arsenate before the fruit is too forward, but if the attack, as often occurs, starts when the fruit is colouring, spraying has to be delayed till the crop is harvested.

### Young Trees.

All young trees should be examined periodically after they commence to shoot. Choice should be made of the strong shoots required for the building of the framework of the tree; other strong shoots should be pinched back. At this early stage it is safer only to pinch back such shoots rather than brush them right off, in case they may be required to take the place of any other chosen shoots that become accidentally broken or destroyed.

### Dormant Buds and Grafts.

Shoots from the stocks carrying dormant buds or grafts should be brushed so that they will not sap the buds or grafts. On old trees that have been worked, a few such shoots could be pinched back, leaving them till the buds or grafts have made sufficient growth to provide shade.

As the growth of the buds or grafts become long enough they should be supported by ties. In the former, if a long stub of the stock is left this can be used to tie the growth to, but if no stub is left, or in the case of grafts, a light stake should be provided. In nursery stock this stake is driven into the ground alongside the stock, and in top-worked trees it should be lashed to the old arm of the stock.

### Black Spot of Orange.

Though Bordeaux mixture has given good control of this disease, the spray has a hardening effect on the tree and a coarsening effect on the fruit; hence it cannot be recommended. In districts where this disease occurs it makes its appearance first and mostly on fruit exposed to the sun on the north-west side of the tree. Hence growers in such districts should make their early pickings from the exposed fruit on this side of the trees, leaving the fruit on the other side for late hanging.

## Prices for Queen Bees.

The prices to be charged at Hawkesbury Agricultural College and Wauchope Government Apiary for queen bees during the coming season have been fixed by the Under Secretary and Director as follows:—Untested (ordinary), 7s. 6d; untested (from imported queens), 12s. 6d.; tested (ordinary), 12s.; tested (from imported queens), 17s.

## A Spraying Query.

Concerning the spraying of grape vines for erinose, a recent correspondent wrote:—"We like to spray as late as possible with dilute sulphuric acid. Would spraying first with lime-sulphur neutralise the sulphuric acid spray used later and make it ineffective?" The writer was informed that the sulphuric acid solution should not be applied immediately after the lime-sulphur, but at an interval of two or three weeks, when there would be no risk of neutralisation.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*Do you consider the reserves of straw and other fodder that may be obtained by using some of the older types of harvesting machinery sufficient to cover the increased cost as compared with the combined harvester? What value do you attach to straw after your experiences of the past two seasons and similarly with regard to cocky chaff?*

*Do you favour harrowing the growing maize crop? What implements do you find most suitable for cultivating the crop as it makes growth?*

*Is your farm producing as fully as it might reasonably and profitably do, the necessary food* (1) *for your household and* (2) *for the working horses? In what direction could you raise something for consumption on the farm that at present has to be purchased?*

*What effect has low-lying, swampy country on the grade of milk or cream? How far does dust from dirty yards, in your opinion, affect the value of the product? Do you adopt any method of ensuring your produce from deterioration in these ways?*

*What are the relative amounts of feed consumed by poultry of different breeds, and by good layers as compared with poor layers?*

*Have you tried thinning out stone and pome fruits in past seasons, and what do you think was the commercial result? On what lines did you proceed, and do you see any reason for modifying your methods with expectation of better profits?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.*

### Auburn.

About thirty members attended the meeting of this branch on 10th July, when, after the general business had been transacted, a lecture was given by Mr. H. J. Rumsey, of Dundas, on tomato culture. The lecturer answered a number of questions at the end of his lecture.

There was a good display of flowers and vegetables. Nine new members joined the branch The membership roll has now reached fifty.

At the monthly meeting on 14th August there was an attendance of twenty-eight members. An address was given by Mr. Ward on utility

poultry. He very fully explained the system of housing he adopted, and also labour-saving devices, feeding, selection of stock, incubation, brooding, and grading out.

At the same meeting a paper was read by Mr. Joseph Robertson on chrysanthemum culture. The selection of cuttings, mode of striking, dates for transplanting, selection of shoots and feeding of the plants were all embraced. Mr. Robertson offered two prizes for the best amateur grower in the forthcoming season.

Mr. George Midgley also offered six different varieties to any novice who exhibited at the show.

A meeting was held on 11th September. A special competition for the best collection of sweet peas was won by Mr. Geo. Midgley. A discussion took place on sweet peas, and some welcome information was given.

### Bimbaya.

At the annual meeting, on 29th July, Mr. G. Alcock presiding, the election of officers resulted thus :—Chairman, Mr. L. L. Heffernan ; Vice-chairmen, Messrs. G. Alcock and A. J. Jones ; Hon. Secretary and Treasurer, Mr. J. R. Boller. The report showed a good year's work, and the balance-sheet a credit of £5 14s. 9d.

A capable paper was read by Mr. J. Britten on fodder conservation, in which the growing of lucerne for hay was advocated. A useful discussion followed on the advantages of lucerne as against silage.

The usual monthly meeting of members was held on 26th August, when eighteen members attended. An address was given by Mr. C. C. Crane, Organizing Inspector of the Bureau, on Bureau matters and co-operation. His address was much appreciated by those present.

### Borenore.

A meeting was held on 10th August at Mr. G. Henderson's orchard, when Mr. S. A Hogg, Assistant Fruit Expert, gave a lecture and demonstration on pruning, and also on budding and grafting. Unfortunately, boisterous weather was experienced all day, but the meeting was well attended. One of the points which impressed those present was the fact that the rich volcanic slopes of the Canoblas was about the only place in New South Wales where it was safe to prune cherry trees in the winter.

An addition has been made to the branch in the form of a cinematograph. This will enable members to have moving pictures of various subjects interesting to them in their respective branches of agriculture.

At the monthly meeting on 21st August, a moving picture show was given by one of the members with the aid of the cinematograph. A most interesting programme was given, though entirely of industrial subjects. The chief pictures shown dealt with the manufacture of coke, the manufacture of manila rope in the Philippines, and forestry in Australia.

### Castlereagh (via Penrith).

At the first meeting of this branch, held on 27th August, and attended by almost fifty persons, a lecture was delivered by Mr. H. Wenholz, Inspector of Agriculture, on maize-growing. The success of the meeting augurs well for the future of the branch.

### Coradgery.

The August meeting was held on 11th August. There was a good attendance of members, and a discussion took place on conservation of fodder. The following motion was carried:—"That this branch, while urging individual effort, also strongly favours a comprehensive national scheme of fodder conservation on the lines set out in the paper read before this branch by Mr. W. E. Tayler, in May, 1919."

The scheme outlined by Mr. Tayler in that paper was a Government guaranteed minimum price for all grain and all classes of pressed hay, which the Government would be prepared to buy delivered at various storage centres in the country, to be sold to stockowners in times of drought at cost price, plus cost of storage, handling, insurance, interest, &c. Mr. Tayler emphasised the fact that farmers could and would grow all the fodder required for their stock if assured of a payable price.

### Coraki.

A meeting of members was held on 17th August, Mr. C. Blackwood presiding. The principal subject of discussion was maize-growing. It was generally agreed that the average yield in the Richmond River district was far from satisfactory, in view of the splendid results that were being obtained in different districts under more advanced methods of cultivation, and with the aid of fertilisers.

It was decided to have a maize-growing competition among members only, the area to be one acre. The Chairman and other members donated prizes.

### Cordeaux-Goondarin.

At a meeting on 1st July, after general business had been transacted, a discussion took place on the six most suitable varieties of apples for the district. The following were most generally chosen:—Lord Nelson, Gravenstein (easily the most profitable), Fanny, Jonathan, Granny Smith, and Yates.

DEPARTMENTAL NOTE.—The Fruit Expert states that the information gathered from the combined experience of the growers is most valuable, and other branches could follow suit with great advantage.

### Cotta Walla.

The monthly meeting was held on 30th August, ten members being present. The topic for discussion was co-operative buying. A lot of correspondence dealing with the matter was read, and the members enthusiastically made preliminary arrangements to give it a trial.

### Cunningar.

At a meeting held on 27th August an interesting discussion took place on tree-planting, and it was decided to approach the Department in regard to the subject.

### Glen Innes.

The first meeting of this branch was held on 7th August, when a lecture was given by Mr. Inspector Handley on spraying fruit. The subject of growing potatoes was also dealt with, and the effort was much appreciated.

### Glenorie.

The annual meeting was held on 31st July, when the following office-bearers were elected for the ensuing year :—Chairman, Mr. F. A. Nicholson; Vice-chairmen, Messrs. E. King and A. Edwards; Hon. Secretary, Mr. G. Hitchcock. The report stated that the year had been a great improvement on previous ones. The membership had reached fifty-three.

The usual monthly meeting, held on 11th September, was well attended. Nearly the whole of the evening was taken up with a discussion on the specimen beehive which had been loaned to the branch by the Department. The branch is fortunate in having a member who has a thorough knowledge of bee-keeping, and with the instructions sent from the Department with the hive the discussion proved extremely interesting. A special night is to be arranged for a further discussion on the subject.

### Henty.

The monthly meeting was held on 21st August, and after the general business had been completed an interesting discussion took place on planting potatoes and fruit-trees, and also on the pruning of fruit-trees. Questions were asked and answered in regard to the spraying of fruit-trees.

The next meeting is to be held on 18th September, when a paper on incubation is to be read by Mr. F. H. Schultz.

### Inverell.

At a well attended meeting on 6th August arrangements were made for the district exhibit at the P. and A. Society's show in 1921, in which the Tingha branch is co-operating.

It was agreed to ask the Government to take steps to establish an irrigation scheme in the north-west.

At a meeting on 27th August Mr. J. Leech read a paper on dairy farming in England. Mr. Leech had been on active service, and, after the armistice, had visited the farming districts of the Old Country. He gave a very interesting account of the progressive condition of farming there. On the whole he thought the Australian farmer should be the better off, as he could own his land, but the methods of the English farmer much impressed him.

### Kellyville.

The annual meeting of members took place on 4th September, when the election of officers resulted thus:—Chairman, Mr. T. Barnwell; Vice-chairmen, Messrs. H. Ellard and W. Rose; Treasurer, Mr. W. Firth; Hon. Secretary, Mr. J. M. Firth. The balance-sheet showed a credit of £6 18s. 10d.

### Lidcombe.

The annual meeting of members was held on 17th August, forty two members being present. The following office-bearers were elected for the ensuing year:—Chairman, Mr. N. Rochester; Vice-chairmen, Messrs. F. Brown and C. M. Macey; Treasurer, Mr. Kennedy; Librarian, Mr. C. M. Macey; Hon. Secretary, Mr. Geo. Fenner; Assistant hon. secretary, Mrs. Sellers. The report showed the branch to be in a flourishing condition, with a membership of seventy-seven. Much useful work and a number of lectures and demonstrations could be recorded in respect of the past year.

On 23rd August Mr. Secombe gave a lecture on tillage, pointing out the benefits derived from ploughing the soil in the orchard, and the value of a well-worked topsoil. He recommended collecting manure, and allowing it

to rot before putting it out on the soil, and thought it a great mistake for people to burn weeds, grass, &c., advising that these should be put in a pit and allowed to decay, after which they could be added to the soil.

The annual social of the branch was held on 26th August, and proved a great success. The prizes won in connection with various competitions during the year were presented during the same evening.

### Lower Portland.

The usual monthly meeting was held on 6th September. The principal business transacted was the election of officers for the ensuing year, the following being the result:—Chairman, Mr. B. King; Vice-chairman, Mr. R. M. Smith; Treasurer, Mr. R. J. Metherell; Hon. Secretary, Mr. H. Hayward; Assistant hon. secretary, Mr. W. C. Gambrill.

The report for the past year shows the branch to be in a strong position, both financially and as regards the number of members. There is a balance of £16 in hand, and a membership of sixty, all financial.

It was decided to hold a social in aid of the Windsor District Hospital.

The schedule for the show to be held next year was revised, eighty extra classes being added, and the prize money increased by about 50 per cent. in nearly all the classes, and in some classes by 100 per cent.

### Mannus.

At the August meeting a paper on planting and care of fruit trees was read by Mr. G. A. Smith.

Mr. E. Breakwell, Agrostologist, visited the district, and lectured under the auspices of the branch on grasses and fodder crops suitable for the district. Cocksfoot, rye grass, Toowoomba canary grass, and clovers were mentioned as useful. Sudan grass and Elephant grass both had their utility; and lucerne, Shearman's clover, maize, grain sorghums (Feterita and Milo) were indicated as promising for local purposes. Specimens of a number of weeds were exhibited, and directions given for their eradication.

### March.

At the meeting held on 18th August, a lecture which seemed to be appreciated by hearers was given by Mr. C. C. Crane, Organizing Inspector of the Agricultural Bureau, on co-operation.

### Matcham.

A lecture on potato culture was given by Mr. A. J. Pinn, Inspector of Agriculture, on 29th July, when there was an attendance of nearly sixty. The lecture dealt fully with the question, and was much appreciated by potato-growers of the district.

Sixteen members accepted an invitation from Mr. Black, of Lisarow, to visit his orchard. They were given an opportunity of inspecting the fruit-packing machine which he had just completed, and they were much impressed with what they saw.

### Milbrulong.

At the meeting held on 9th August, Mr. C. C. Crane gave an address on co-operation, which was much appreciated.

On 30th August Mr. Breakwell gave a lecture, illustrated by lantern slides, on grasses and weeds. Fifty members were present, and greatly benefited by the way in which the subject was dealt with.

During the day Mr. Breakwell visited various grazing areas, and remarked on the pastures. It was felt that his visit was of great value to members.

Another meeting was held on 1st September, when the rules drawn up for the proposed co-operative store were read. It was decided to issue 6,000 shares at £1 each, of which amount 10s. per share was to be called up.

### Miranda.

The annual meeting was held on 12th July, Mr. E. Thacker presiding, and about sixty members attending. The report showed that the year had been one of much activity, ten valuable lectures having been given during the year, and several "exhibit evenings," when fruit, flowers, and vegetables were brought along. A poultry farms competition was in progress. Meetings had been held in connection with the fodder question, and members had twice visited Hawkesbury Agricultural College. There was an excess of assets over liabilities of £26 17s. 10d., and the membership was 144 ordinary, and thirty-six honorary.

The election of officers resulted thus: Chairman, Mr. E. Thacker; Vice-chairmen, Messrs. E. W. Phillips and A. J. Burton; Treasurer, Mr. J. W. Macfarlane; Librarian, Mr. Buckland; Chairwoman, ladies' committee, Mrs. Howard; Hon. Secretary, Mr. A. Wigzell; Assistant secretary, Mr. H. C. Collon.

A meeting was held on 16th August, when Mr. Hadlington, Poultry Expert, gave an interesting and instructive lantern lecture on the diseases and parasites of poultry. The meeting was largely attended, and many questions were asked. These illustrated lectures are much appreciated.

On 30th August, Mr. A. A. Ramsay, Principal Assistant Chemist, gave a lecture on soil moisture. The meeting was well attended, and many questions were asked.

### Mittagong.

A letter was given by Mr. J. Hadlington on poultry subjects at the August meeting of this branch. He dwelt emphatically on the necessity of the young chicks getting the right food at the right time to bring them to maturity and to maintain the stamina to enable them to be egg-producers. He remarked that, no matter the pedigree of the bird, unless well fed in its early stages it would not become profitable.

Principal H. W. Potts visited the district on 28th August, and gave a yard lecture with demonstrations on pigs and their management to forty-six people. Those present were all associated with pig-raising, and the discussion which followed was of a sound and practical character. A number of departmental publications, bulletins and seeds were distributed. The premises and stock of the State Boys' Home pig department was used for the purpose of the lecture.

### Moss Vale.

On 6th August, Mr. R. N. Makin, Inspector of Agriculture, visited this branch, and gave a lecture on the growing of fodder crops. He strongly advised the sowing of clover. Lucerne might also prove of advantage. The seed-bed in each case required to be well packed.

### Orchard Hills.

The annual meeting was held on 30th August. The Treasurer's statement showed a balance of £4 18s. 1d. The election of officers resulted thus:—Chairman, Mr. E. Basedow; Vice-chairmen, Messrs. L. H. Preston and J. Dickson; Treasurer, Mr. E. Basedow; Hon. Secretary, Mr. K. Basedow.

At the ordinary meeting members agreed to co operate for the purpose of securing quantities of agricultural lime. Mr. L. H. Preston exhibited a sheaf of Sunrise oats, 3 feet 6 inches high, and its clean appearance commended it to others. The feed the crop yielded doubled the quantity of milk from his cows during last winter.

### Penrose-Kareela.

The monthly meeting was held on 8th July, when a discussion took place on the different methods of pruning and spraying peaches.

The August meeting was held on 14th of the month at Messrs. Luke Bros.' residence. The major portion of the evening was taken up discussing the benefits likely to be derived by forming a branch of the Fruitgrowers' Association. Short discussions took place on various subjects, among others being spraying and manuring.

The September meeting was held at Mr. O. Clews' residence on the 13th A committee was formed to handle all matters concerning the annual picnic.

### Springside.

Mr. T. C. Bowen read an interesting paper before this branch at the August meeting, his subject being nitrogenous and other fertilisers, their sources, and the crops to which they are beneficial. The whole subject was very instructively handled, and members thoroughly appreciated the paper.

At the same meeting Mr. W. Giles read a paper on the chief mechanical operations necessary to the production of crops and their various effects on the soil. This paper also was listened to with interest and satisfaction.

The usual monthly meeting was held on 7th September, when a discussion took place on co-operation. Some twenty members were present.

### Stony Point (via Leeton).

A meeting was held on 4th August, when a discussion took place on the recent pruning demonstration given by Mr. Arthur, orchardist at Yanco Experiment Farı

### Stratford.

The report read at the annual meeting of this branch, on 21st August, showed a year of successful endeavour had closed, and the prospects for the coming year were regarded as very promising. A balance of £2 1s. 9d. was in hand. The election of officers resulted thus:—Chairman, Mr. T. Germon; Vice-chairman, Mr. E. Gresham; Treasurer, Mr. J. Germon; Hon. Secretary, Mr. P. H. Deards.

### Taralga.

This branch has been reorganised, and the following gentlemen have been elected as office-bearers:—Chairman, Mr. John Quinn; Vice-chairmen, Messrs. James Howard and H. Dwynan; Treasurer, Mr. John Fitzgibbon; Hon. Secretary, Mr. Dave Mullaney.

### Thyra-Bunaloo.

A meeting was held on 27th August. An interesting discussion took place on drilling *versus* broadcasting seed-wheat. Several members advocated broadcasting for early sowing before rains, as it assured a better germination

under unfavourable conditions. For sowing after the rains, most members were unanimously for the drill, as the seed and manure could be placed just where the moisture was—conditions which favoured speedy germination.

DEPARTMENTAL NOTE.—The Chief Inspector states that the broadcasting would require a larger quantity of seed; but, as the grain would be in contact with only dry soil, no loss would result from malting.

### Tingha.

This branch met on 7th August, when Mr. Ayland read a paper on fruit-growing, in which he indicated the knowledge essential to success. The selection of the most suitable kinds for the district was discussed.

### Toronto.

At the August meeting it was decided to hold the annual show as usual, and various arrangements were made for the event.

At a later meeting in September, the preparations for the show were further advanced, and the decision arrived at that the net proceeds be equally divided between Wallsend hospital and the branch's show fund.

### Wellington.

The monthly meeting was held on 7th August, there being a large attendance. During the evening two papers were read, one by Mr. E. G. Kimbell on vegetable culture, and the other by Mr. A. V. Brown on growing annuals, biennuals and perennials. The forthcoming flower show was also further discussed, and details arranged, Mr. A. T. Smith being appointed steward.

At a subsequent meeting, Mr. E. Jurd read a paper on seeds and seed-sowing, describing at considerable length the conditions most favourable to germination and growth, and giving many valuable suggestions. It was especially necessary, he said, in order to obtain early maturity, to keep down weeds and to maintain a loose, open surface by mulching freely with horse or cow manure.

### Wentworthville.

The branch met on 4th August, when Mr. A. E. Anderson read a paper on vegetable-growing, in which he protested against "the craze for size," connecting it with the standards of many judges at shows. The aim should be good, succulent vegetables when cooked. Many valuable suggestions were made on the culture of different vegetables, and at the close of the paper a number of useful questions were raised and discussed.

At the meeting on 1st September fifty-two members were present. After the general business had been dealt with a lecture on the culture of roses, with a pruning demonstration, was given by Mr. H. F. Emert. The lecturer treated the subject from start to finish and gave numerous blackboard illustrations in regard to the methods of pruning.

Some fine sweet peas were exhibited by members, and the schedule of the spring show was distributed. The branch is in a very active and progressive condition at the present time.

### Windsor.

At the July meeting, after the general business had been disposed of, a discussion took place in connection with the staging of an exhibit at the next Hawkesbury District Agricultural Show. Several members have already begun to raise produce for the occasion. This branch has financially and numerically broken its previous record.

### Woonona.

At the fourth annual meeting the report showed there are 163 financial members on the roll. There was a credit balance of £71 1s. 10d., which should take some beating. There were twelve meetings during the year, at each of which papers were read or a discussion on some agricultural topic took place. There were also a general show in January and a flower show in April, each event being an educational, financial, and social success. It was decided to have a two days' show in January next, and preparations are already being made. During the latter part of the financial year co-operative buying was entered into and 108 bags of chickwheat were sold to members at a considerable reduction on local store prices; 115 fruit trees were also sold to members at cost price. An extension of these operations is expected, and any other branch that has produce to sell might communicate with the secretary. It is intended to start experimental plots locally.

Much of the success achieved by this branch has been due to the untiring efforts of the retiring Secretary, Mr. Henry Coltman, and the Treasurer, Mr. G. Fowler.

### Yarramalong.

The usual monthly meeting was held on 8th September. After the general business had been disposed of, a distribution of seed was made among the members, and a discussion took place on its cultivation.

### Yarrunga-Avoca.

At the monthly meeting on 26th June, after the general business had been dealt with, Mr. W. S. Smith, manager of the local butter factory, gave a very interesting demonstration of milk and cream testing, for which he was accorded a hearty vote of thanks.

The monthly meeting was held on 24th July, when a general discussion took place on the buying of manures. It was decided that no advantage would be gained by doing this for the time being.

The Treasurer, Mr. Starkey, gave an interesting lecture on first aid to the injured, for which he received a hearty vote of thanks.

At a meeting on 28th August, a discussion took place on the cost of producing butter on an average farm in the district. The figures for one local farm were presented, which showed that with a property worth £1,834, cattle £412, horses £48, machinery, &c., £89, total £2,383, the annual charges altogether were £407 16s. 8d., made up of £104 3s. interest on capital (£15 being allowed for house rent), £13 7s. depreciation, and £290 6s. 8d. labour for 580 days at 10s. per day for eight hours. If incidental receipts of £28 2s. 9d. were deducted from the £407 16s. 8d., there would be left £379 13s. 11d. against the 3,135 lb. butter produced, whereas the actual receipts for butter were £226 11s 8d. This farm was thus working at a loss, and the farmer should get at least 2s. 6d. per lb. for his butter if he were to make his place pay.

It was agreed that other farms in the district would double the above sum with the same or even less labour.

# AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Coonamble P. and A. Association | J. C. Wilson | Oct. 20 |
| Millthorpe A., H., and P. Association | C. J. E. Hawken | ,, 27 |
| Lismore A. and I. Society | H. Pritchard | Nov. 10, 11 |
| Tweed River A. Society | T. M. Kennedy | ,, 24, 25 |

## 1921.

| Society. | Secretary. | Date. |
|---|---|---|
| Albion Park A. and H. Association | H. R. Hobart | Jan. 14, 15 |
| Gosford District A. Association | H. G. Parry | ,, 21, 22 |
| Kiama A. Society | G. A. Somerville | ,, 25, 26 |
| Nimbin A. and I. Society | W. P. Stanger | Feb. 2, 3 |
| Wollongong A., H., and I. Association | W. J. Cochrane | ,, 3, 4, 5 |
| Cobargo A., P., and H. Society | T. Kennelly | ,, 9, 10 |
| Shoalhaven A. and H. Association | H. Rauch | ,, 9, 10 |
| Central Cumberland A. and H. Assoc. (Castle Hill) | H. A. Best | ,, 11, 12 |
| Ulladulla A. and H. Association (Milton) | R. F. Cork | ,, 16, 17 |
| Guyra P., A., and H. Association | P. N. Stevenson | ,, 16, 17, 18 |
| Blacktown and District A. Society | J. McMurtrie | ,, 18, 19 |
| Dapto A. and H. Society | F. James | ,, 18, 19 |
| Yanco Irrigation Area Agricultural Society | R. Tribe | ,, 22, 23 |
| Southern New England P. and A. Association (Uralla) | H. W. Vincent | ,, 22, 23, 24 |
| Dorrigo and Guy Fawkes A. Association | A. C. Newman | ,, 23, 24 |
| Mirrool M.I.A., A. Society (Griffith) | F. A. Browne | ,, 23, 24 |
| Hastings River A. and H. Society (Wauchope) | A. D. Suters | ,, 24, 25 |
| Newcastle A., H., and I. Association | E. J. Dann | ,, 24, 25, 26 |
| Nepean District A., H., and I. Society | C. H. Fulton | ,, 25, 26 |
| Tamworth P. and A. Association | J. R. Wood | Mar. 1, 2, 3 |
| Manning River A. and H. Association (Taree) | R. N. Stow | ,, 2, 3 |
| Oberon A., H., and P. Association | A. E. Burcher | ,, 3, 4 |
| Hunter River A. and H. Association (West Maitland) | E. H. Fountain | ,, 3, 4, 5 |
| Berrima District A., H., and I. Society (Moss Vale) | J. W. Kenny | ,, 3, 4, 5 |
| Camden A., H., and I. Society | A. E. Baldock | ,, 3, 4, 5 |
| Bellinger River A. Association | J. F. Reynolds | ,, 4, 5 |
| Mudgee A., P., H., and I. Association | E. J. Hannan | ,, 8, 9, 10 |
| Glen Innes P. and A. Society | Geo. A. Priest | ,, 8, 9. 10 |
| Tumbarumba and Upper Murray P. and A. Society | E. C. Cunningham | ,, 9, 10 |
| Taralga A., P., and H. Association | J. J. Kearney | ,, 10, 11 |
| Gloucester P., A., and H. Society | F. H. Chester | ,, 10, 11 |
| Goulburn A., P., and H. Society | F. D. Hay | ,, 10, 11, 12 |
| Armidale and New England P., A., and H. Assocn. | A. H. McArthur | ,, 15, 16, 17, and 18 |
| Upper Hunter P. and A. Association | R. C. Sawkins | ,, 16, 17 |
| Macleay A., H., and I. Association (Kempsey) | E. Weeks | ,, 16, 17, 18 |
| Royal Agricultural Society of N.S.W. | H. M. Somer | ,, 21 to 30 |
| Upper Manning A. and H. Association (Wingham) | D. Stewart | April 13, 14 |
| Narrabri P., A., and H. Association | C. C. Baker | ,, 13, 14, 15 |
| Clarence P. and A. Society (Grafton) | L. C. Lawson | ,, 13, 14, 15, and 16 |
| W.D.A. and H. Society (Nabiac) | G. O'Connor | ,, 21, 22 |
| Dungog P. and A. Association | W. H. Green | ,, 28, 29, 30 |
| Hawkesbury District A. Association | H. S. Johnston | May 12, 13, 14 |
| Murrumbidgee P. and A. Association (Wagga) | A. F. D. White | Aug. 23, 24, 25 |

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THE

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OF

# NEW SOUTH WALES

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1920.

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# PROSPECTUS

OF

# New South Wales Government Loan of £3,000,000.

**RATE OF INTEREST, 5½ PER CENT. PER ANNUM.**

**PRICE OF ISSUE: PAR. (Payable in Instalments).**

**Interest Payable 1st June and 1st December.**
**A Full Six Months' Interest will be Payable 1st June, 1921.**
**Principal Repayable at Par, in Sydney, 1st December, 1930.**
**List of Applications closes Monday, 3rd January, 1921.**

The Government of New South Wales offers for subscription a loan of £3,000,000, bearing interest at the rate of 5½ per cent. per annum, and having a currency of 10 years from 1st December, 1920, a guarantee being given that the interest will be free of both New South Wales and Federal Income Taxes.

The loan is being raised under the authority of the Act of Parliament, No. 27 of 1919, and is for the purpose of providing funds to be applied towards the completion of the North Coast Railway, the Railways from Dubbo to Werris Creek, Glenreagh to Dorrigo, and Canowindra to Eugowra, Hydro-Electric Schemes for South-west Riverina and North Coast, and other Public Works and Services.

Applications for the loan should be addressed to the Colonial Treasurer, The Treasury, Sydney.

The principal is payable in instalments, as follows, viz.:—

**£25 per cent. on Wednesday, 1st December, 1920;**
**£25 per cent. on Monday, 3rd January, 1921;**
**£25 per cent. on Tuesday, 1st February, 1921;**
**£25 per cent. on Tuesday, 1st March, 1921;**

and will be accepted free of exchange.

Applications made after 1st December, 1920, must be accompanied by interest at 5½ per cent. per annum, from that date to date of lodgment of the first instalment of £25 per cent. Any second, third, or final instalment not paid on its respecitve due date must also have interest to date of payment added.

The loan may be subscribed for either in the form of Bonds or Funded Stock at the option of the subscriber.

Bonds or Stock may be purchased in multiples of £10.

Subscribers for Funded Stock may have the interest on their Stock remitted to their Bank accounts in the country or outside the State free of exchange, but the interest on the Bonds will be payable in Sydney.

Forms of application for the loan may be obtained from the Registrar of Stock, The Treasury, Sydney; from the Branches of the Government Savings Bank of New South Wales throughout the State; and also at all Branches in the State of the Bank of New South Wales and the Commercial Banking Company of Sydney, Limited.

Deposits and instalments will be accepted at the Treasury, Sydney, or at any of the Branches of the Banks named.

Applications for the loan may be forwarded through members of recognised Stock Exchanges.

JOHN T. LANG,
Colonial Treasurer.

The Treasury,
Sydney, 1st October, 1920.

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# Sheep and Wool for Farmers.
## CROSS-BREEDING EXPERIMENTS.

### Results of Lamb-raising Trials.

J. WRENFORD MATHEWS.

FOLLOWING upon the report published in the latter part of last year dealing specifically with the results of the first phase of the crossbreeding experiments conducted by the Department—the results of the second phase are now presented showing the lambs from the crossbred ewes most suitable for local and export requirements.

It may be explained that at the outset these tests were divided into two sections. In the first place, longwool rams of several breeds were tried on Merino ewes to ascertain which crossbred provided the most serviceable wool and mutton strain. That is the phase that has already been dealt with. In the second place, rams of the shortwool group of breeds were crossed on ewes of the longwool crosses, with the object of obtaining data as to the most desirable cross for the lamb market. The breeds used in this latter connection were South Down, Shropshire, and Dorset Horn.

The farms at which the investigations were conducted were the same as in the case of the first crosses, namely Wagga, Cowra, and Bathurst. As the experiments were commenced in 1912 at the first, and in 1913 at the two latter farms, and terminated respectively in 1918 and 1919, we now have available for comparison results embracing seven years' records from each of these farms. The results afford a very fair criterion of the potentialities of the districts named for this particular line of sheep-breeding, more particularly as they cover a period having some years much below and others much above the average season.

### A Word on Lamb-raising.

Before proceeding to analyse the results it may be of use to say just a word or two on the raising and marketing of lambs in New South Wales.

Lamb-raising may be regarded as a separate branch of the sheep industry. It embraces the raising of a lamb whose body is exceptional on the score of early maturity and whose carcase will attain a requisite standard of weight at or before the weaning stage—about the age of 5 months. It is well within the practice of the small wheat and sheep farmer, and it is a form of production in which he may most profitably specialise. Lamb's flesh averages from 1½d. to 2d. per lb. more than ordinary trade mutton, provided it is bred on the right lines and is marketed in prime condition.

A

There are many who are anxious to cater for this demand, but it would seem that few are seized with its special requirements.

The lamb's carcase for export should weigh from 33 to 40 lb. It should be plump, well rounded, with the flesh equally distributed as far as possible over all parts. Frequently first-cross sheep are marketed with the object of catering for this special demand, but it may be again pointed out that animals bred on those lines only partially fill the requirements of the trade.

Generally, the Australian-bred product is recognised abroad as "firsts," "seconds," and "thirds," due regard for shape and quality being had in each case. Lambs scaling from 33 to 38 lb., with an average weight of 35 lb., are regarded as first grade; those from 28 to 33 lb., averaging 30 lb., constitute the second grade, and those from 26 to 28 lb. are known as third grades. Sometimes first grades are classed into "heavy" and "light," from 38 to 44 lb. being classed as heavy firsts—quality and shape, of course, being duly regarded.

From the results which have been obtained it has been observed that first crosses of longwools x Merinos usually scale from 28 to 30 lb. dressed weight, unless, of course, the season is an exceptional one. It is therefore obvious that under average normal conditions the best interests of the lamb trade are not being conserved if these first crosses are marketed as suckers. Opinions of experts, both in Australia and abroad, have been sought during the conduct of the trials, and they all agree that first crosses are too long and slender, and lack the compactness, plumpness, and finish of second crosses. Usually they were classed as third grades. It is to ascertain which of the shortwool breeds is most suitable for the production of the best class of lamb, and incidentally in the hope that it may be possible to place this branch of the wool and mutton industry on a better footing, that these trials have been conducted.

### Districts where Lamb-raising may be Profitable.

It must not be imagined that all districts of New South Wales are suitable for lamb-raising. Special conditions are required to ensure success, climate and rainfall playing the most important parts. The climate must be cool and the rainfall distributed throughout the year to ensure a sufficiency of food that will maintain the lamb in a natural state of development from the time it is dropped until it reaches the marketable stage. The provision of a proper food supply in the way of fodder crops will ensure success, but little can be achieved in this connection unless the rainfall be favourable.

The operations, too, will require to be co-ordinated with the natural breeding instincts of the ewe. The ewes will require to be mated at such time as will ensure the lambs being dropped in the autumn and marketed in the spring. For such ideal conditions we must look to those regions where rain begins in the autumn and falls intermittently throughout the winter and spring. It is interesting to note that it is in those districts where wheat-growing can be most successfully and profitably undertaken that

lamb-raising is most practicable. Other localities afford similar facilities in a measure; but, broadly speaking, it is within the south-eastern portion of the State that the conditions are most favourable.

Distance from railway and facilities for transport are also factors which must be taken into account as contributing to the success or otherwise of a lamb-raising venture. Once separated from their mothers, lambs naturally waste and decrease in weight, and it is essential that as little time as possible should be lost between weaning and killing. Hence, promptness of despatch is essential, but it is also obvious that in order to retain weight and succulence slaughtering should take place as near to the place of abode as circumstances and transport facilities will permit.

In this report, in addition to the live weights of the lambs of different crosses and their values, the loss of weight incurred in forwarding the lambs to Sydney from the several farms is shown.

### Lambing Results from the Various Classes.

Records were also kept at each farm of the breeding propensities of the ewes of the various crosses, percentage of lambs marked, number of ewes assisted, and number of deaths at or during parturition as the result of ewes having been mated with rams of the different shortwool breeds.

The average behaviour of each cross in each respect throughout the seven years is presented in the tables which follow, the results from the three farms being shown first separately, and then as a combined average.

Wagga Experiment Farm Averages, 1912 to 1918 (inclusive).

| Breed of Lambs. | Percentage of Rams used. | Number of Ewes Mated. | Percentage of Lambs. | Ewes Assisted. | Deaths of Ewes at Lambing Time. | | |
|---|---|---|---|---|---|---|---|
| | | | | | Before. | At. | After. |
| South Down x Lincoln-Merino, $D_1L_1M$ ... | 3 | 122 | 77·8 | 2 or 1·6 % | ... .. | 5 or 4·9 % | ... ... |
| South Down x Leicester-Merino, $D_1L_2M$ .. | 3 | 121 | 85·1 | 1 or ·8 ,, | ...... | 8 or 6·6 ,, | ...... |
| South Down x Border Leic.-Merino, $D_1L_3M$ | 3 | 183 | 87·9 | 1 or ·5 ,, | ... . | 9 or 4·8 ,, | ...... |
| Shropshire x Lincoln-Merino, $D_2L_1M$ ... | 3 | 125 | 68 | 3 or 2·3 ,, | ...... | 1 or ·8 ,, | 1 or ·8 % |
| Shropshire x Leicester-Merino, $D_2L_2M$ ... | 3 | 124 | 83 | 2 or 1·6 ,, | 1 or ·8 % | ......... | ...... |
| Shropshire x Border Leic.-Merino, $D_2L_3M$ | 3 | 192 | 99·9 | 5 or 2·4 ,, | ...... | 2 or 1 ,, | ...... |
| Dorset Horn x Lincoln-Merino, $D_5L_1M$ ... | 3 | 112 | 97·3 | 2 or 1·8 ,, | ...... | 8 or 7·5 ,, | ...... |
| Dorset Horn x Leicester-Merino, $D_5L_2M$ ... | 3 | 130 | 62·3 | 4 or 3 ,, | ...... | 3 or 2·3 ,, | ...... |
| Dorset Horn x Border Leic.-Merino, $D_5L_3M$ | 3 | 198 | 73·7 | 6 or 3 ,, | 1 or ·5 % | 8 or 4 ,, | 1 or ·5 % |

From the standpoint of virility there is little to choose between the rams of the three breeds. The South Downs and Shropshires are about equal in the percentage of lambs dropped by the three groups of ewes collectively, while the Dorset Horn is at a slight disadvantage.

Similarly, comparing the ewes of the three different crosses which were mated with the three different breeds of rams we find that the Border Leicester cross heads the list, with the Lincoln second, and the Leicester in the third position. The percentages of ewes assisted indicate that the Dorset Horn crossbred lambs are most difficult of parturition, and the Shropshire lambs next, while the deaths were most numerous where South Down rams had been used and least so where Shropshire rams.

We may now look at the records tabulated in these connections for the Cowra Farm.

Cowra Experiment Farm Averages, 1913 to 1919 (inclusive).

| Breed of Lambs. | Percentage of Rams used. | No. of Ewes Mated. | Percentage of Lambs. | Ewes Assisted. | Deaths of Ewes at Lambing Time. | | |
|---|---|---|---|---|---|---|---|
| | | | | | Before. | At. | After. |
| $D_1L_1M$ | 2·5 | 189 | 66·1 | 2 or 1 % | 4 or 2 % | 1 or ·5 % | ...... |
| $D_1L_2M$ | 2·5 | 205 | 60·6 | ...... | 1 or ·5 ,, | ...... | ...... |
| $D_1L_3M$ | 2·5 | 138 | 80·4 | ...... | ...... | ...... | 1 or ·4 % |
| $D_2L_1M$ | 2 | 205 | 72·6 | ...... | 1 or ·5 % | ...... | ...... |
| $D_2L_2M$ | 2 | 202 | 69·8 | 1 or ·5 % | 4 or 2 ,, | 1 or ·5 % | 3 or 1·5 % |
| $D_2L_3M$ | 2 | 151 | 84·7 | ...... | 3 or 2 ,, | 1 or ·6 ,, | 1 or ·6 ,, |
| $D_5L_1M$ | 2 | 198 | 64·6 | 2 or 1·8% | 2 or 1·8 ,, | 1 or ·9 ,, | ...... |
| $D_5L_2M$ | 2 | 210 | 72·3 | ...... | 3 or 1·5 ,, | 2 or 1 ,, | ...... |
| $D_5L_3M$ | 2 | 140 | 84·2 | 2 or 1·6% | 5 or 3·5 ,, | 2 or 1·6 ,, | 1 or ·7 % |

The results again show little disparity as to the rams. The Shropshire this time heads the list with the best lambing, and the Dorset Horn comes second

Tracing the breeding propensities of the ewes, we again find the Border Leicester cross at the head of the list with a substantial advantage in the percentage of lambs marked.

The number of ewes assisted at this farm was practically negligible, but the figures reveal a greater mortality at lambing time, and here the Dorset Horn is seen to disadvantage.

Bathurst Experiment Farm Averages, 1913 to 1919 (inclusive).

| Breed of Lambs. | Percentage of Rams used. | Number of Ewes Mated. | Percentage of Lambs. | Ewes Assisted. | Deaths of Ewes at Lambing Time. | | |
|---|---|---|---|---|---|---|---|
| | | | | | Before. | At. | After. |
| $D_1L_1M$ | 2·5 | 101 | 84 | 1 or 1% | ...... | ...... | ...... |
| $D_1L_2M$ | 2·5 | 91 | 92 | 4 or 4·4 ,, | ...... | ...... | ...... |
| $D_1L_3M$ | 2·5 | 100 | 92 | 5 or 5 ,, | 2 or 2% | ...... | 1 or 1% |
| $D_2L_1M$ | 2·5 | 100 | 90 | 4 or 4 ,, | 3 or 3 ,, | ...... | ...... |
| $D_2L_2M$ | 2·5 | 97 | 76 | 3 or 3 ,, | 2 or 2 ,, | 1 or 1% | ...... |
| $D_2L_3M$ | 2·5 | 103 | 70 | 4 or 4 ,, | 1 or 1 ,, | ...... | ...... |
| $D_5L_1M$ | 2·5 | 99 | 87 | 7 or 7% | 4 or 4 ,, | 1 or 1% | ...... |
| $D_5L_2M$ | 2·5 | 95 | 93 | 9 or 9·4 ,, | 3 or 3 ,, | ...... | 1 or 1% |
| $D_5L_3M$ | 2·5 | 104 | 81 | 14 or 13·9 ,, | 6 or 5·7 ,, | 2 or 2% | 1 or 1 ,, |

On comparing the percentage of lambs by the different rams as formerly, we observe the relative positions to have changed. At this farm the South Down is ahead of the other two, with the Dorset Horn next, and the Shropshire in third place.

The percentage of lambs dropped for each cross is higher in the case of this farm than at the other two, and little difference is shown between the percentages from the different groups. Contrary to previous results, the Border Leicester cross ewes were behind the other two.

The number of ewes assisted at parturition was in direct contrast to the figures recorded at the other farms—the Border Leicester cross ewes showing to greatest disadvantage. While the percentage of lambs was greater, the mortality at lambing time was also heavier, the Dorset Horn cross having the worst record in this respect.

In the next table the figures for all three farms are brought together and averaged.

TABLE I.—Combined Averages of Lambing Results at Wagga, Cowra, and Bathurst Experiment Farms.

| Breed of Lambs. | No. of Ewes Mated. | Percentage of Lambs. | Ewes Assisted. | Deaths of Ewes at Lambing Time | | | Mortality Percentage in Ewes. |
|---|---|---|---|---|---|---|---|
| | | | | Before. | At. | After. | |
| $D_1L_1M$ | 412 | 75·9 | 5 or 1·2 % | 4 | 6 | ... | 2·4 |
| $D_1L_2M$ | 417 | 79·2 | 5 or 1·2 ,, | 1 | 8 | ... | 2·1 |
| $D_1L_3M$ | 421 | 86·7 | 6 or 1·4 ,, | 2 | 9 | 1 | 2·8 |
| $D_2L_1M$ | 430 | 76·8 | 7 or 1·6 ,, | 4 | 1 | 1 | 1·4 |
| $D_2L_2M$ | 423 | 76·2 | 6 or 1·4 ,, | 6 | 2 | 3 | 2·6 |
| $D_2L_3M$ | 446 | 84·8 | 9 or 2·1 ,, | 5 | 3 | 1 | 2·0 |
| $D_5L_1M$ | 409 | 82·9 | 11 or 2·6 ,, | 6 | 10 | ... | 3·9 |
| $D_5L_2M$ | 435 | 75·8 | 13 or 3·0 ,, | 6 | 6 | 1 | 3·0 |
| $D_5L_3M$ | 442 | 79·6 | 22 or 5·0 ,, | 12 | 12 | 3 | 6·1 |

The main points in this table are : (1) the percentage of lambs by the rams of the three breeds, and (2) the number of lambs dropped by the three strains of ewes collectively.

Dealing with the prepotency of the rams first, the figures indicate that the South Down rams left the largest percentage of lambs, approximately 80 per cent. over the three groups of ewes, the Dorset Horn rams next with approximately 76 per cent., and the Shropshire rams third with approximately 74 per cent.

On the average, about 2·5 per cent. of rams was employed throughout, so that the individuality of any one ram did not exert an undue influence on the proportion of lambs dropped by either of the three groups of ewes. If by chance one individual happened to prove more prepotent than the other, any such individuality would be balanced by the averages, seeing that these figures have been taken from the consolidated averages from all three farms over a number of years.

Turning to the other aspect of the table, it will be observed that the Border Leicester x Merino ewes gave the largest percentage of lambs, approximately 83 per cent. The Lincoln x Merino ewes came next with a percentage of about 78, and the Leicester x Merino last with approximately 77 per cent.

As the records have been taken over an extended period, embracing seasons above and below normal, and every care has been taken to secure as high an increase of lambs as circumstances would permit, the results afford a very fair indication of the percentage of lambs that may reasonably be expected under such conditions. Even with the figures before us we would not like to go so far as to say that any one strain of ewe was a more ready breeder than the others, but from the results we may safely deduce that the Border Leicester cross ewe has given ample proof of its natural propensity to yield a fair increase under the conditions outlined.

The number and percentage of ewes assisted at parturition and of those dying at lambing time after service by the three different breeds of rams may be gathered from the following summary, which includes ewes from all three groups:—

| Ram. | Number of Ewes Mated. | Ewes Assisted | Deaths. |
|---|---|---|---|
| $D_1$ | 1,260 | 16 or 1·2 per cent. ... | 31 or 2·4 per cent. |
| $D_2$ | 1,299 | 22 or 1·7 ,, ... | 26 or 2 ,, |
| $D_5$ | 1,286 | 46 or 3·5 ,, ... | 56 or 4·3 ,, |

Taking the other point of view—the strain of ewe that most required assistance at parturition and of which most died during lambing, as a result of mating with the three breeds of rams—the figures can be summarised thus:—

| Strain of Ewe. | Number of Ewes Mated. | Ewes Assisted. | Deaths. |
|---|---|---|---|
| $L_1M$ | 1,251 | 23 or 1·8 per cent ... | 32 or 2·5 per cent. |
| $L_2M$ | 1,275 | 24 or 1·9 ,, ... | 33 or 2·6 ,, |
| $L_3M$ | 1,309 | 37 or 2·8 ,, ... | 48 or 3·7 ,, |

The results, however, cannot be decided on one point alone; they will require to be worked out in their entirety. We must consider the body weight of the lamb and the market value of the carcase before arriving at a definite conclusion.

### The Development of the Lambs.

The weights of the lambs of each cross were taken each month until five months old, and the next series of tables gives the average of each cross at each farm. We begin with Wagga Experiment Farm again.

Wagga Experiment Farm—1913 to 1918 (inclusive)—Average Weights.

| Breed of Lambs. | Number | First Weighing. | | Second Weighing. | | Third Weighing. | | Fourth Weighing. | | Average Increase after First Weighing. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb. | oz. | lb. | oz | lb. | oz. | lb. | oz. | lb. | oz. |
| $D_1L_1M$ | 73 | 29 | 0 | 42 | 7 | 56 | 8 | 69 | 15 | 13 | 10 |
| $D_1L_2M$ | 97 | 28 | 8 | 40 | 9 | 54 | 5 | 66 | 13 | 12 | 2 |
| $D_1L_3M$ | 133 | 33 | 4 | 44 | 9 | 57 | 13 | 70 | 4 | 12 | 5 |
| $D_2L_1M$ | 67 | 30 | 0 | 40 | 12 | 54 | 7 | 67 | 2 | 12 | 6 |
| $D_2L_2M$ | 93 | 29 | 9 | 41 | 15 | 53 | 8 | 68 | 5 | 12 | 14 |
| $D_2L_3M$ | 163 | 30 | 9 | 43 | 8 | 57 | 15 | 72 | 10 | 14 | 3 |
| $D_5L_1M$ | 84 | 32 | 6 | 45 | 4 | 59 | 9 | 72 | 2 | 13 | 4 |
| $D_5L_2M$ | 77 | 34 | 2 | 47 | 6 | 62 | 13 | 78 | 0 | 14 | 10 |
| $D_5L_3M$ | 123 | 35 | 11 | 49 | 15 | 64 | 13 | 79 | 13 | 14 | 11 |

The ewes were mated during the first and second week in December, and the lambs marked about the second and third veek in July, when the first weighing was taken. The rams were run with the ewes about eight weeks.

The two factors most noticeable are the increase in weight of the lambs by the Dorset Horn rams and the higher averages recorded by the lambs from Border Leicester x Merino ewes.

Cowra Experiment Farm, 1913 to 1918 (inclusive)—Average Weights.

| Breed of Lambs. | No. | First Weighing. | | Second Weighing, | | Third Weighing. | | Fourth Weighing. | | Average Increase after First Weighing. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb. | oz. | lb. | oz. | lb. | oz. | lb. | oz. | lb. | oz. |
| $D_1L_1M$ | 102 | 29 | 14 | 41 | 10 | 55 | 3 | 61 | 1 | 10 | 11 |
| $D_1L_2M$ | 107 | 28 | 15 | 40 | 9 | 54 | 7 | 62 | 3 | 11 | 1 |
| $D_1L_3M$ | 83 | 28 | 1 | 40 | 9 | 53 | 8 | 63 | 13 | 11 | 4 |
| $D_2L_1M$ | 130 | 26 | 8 | 38 | 6 | 51 | 15 | 60 | 0 | 11 | 2 |
| $D_2L_2M$ | 110 | 29 | 11 | 38 | 14 | 54 | 0 | 59 | 12 | 10 | 0 |
| $D_2L_3M$ | 105 | 28 | 5 | 38 | 8 | 55 | 14 | 62 | 2 | 11 | 4 |
| $D_5L_1M$ | 108 | 30 | 15 | 41 | 7 | 57 | 1 | 64 | 1 | 11 | 0 |
| $D_5L_2M$ | 108 | 31 | 12 | 43 | 7 | 59 | 10 | 66 | 9 | 11 | 9 |
| $D_5L_3M$ | 89 | 30 | 0 | 44 | 14 | 59 | 1 | 68 | 7 | 12 | 13 |

During 1913–14 the sheep were mated in November and December, but only 11 per cent. of lambs was recorded in 1913 and 37 per cent. in 1914. The mating period was then altered to January and February, with the result that the average increase improved. The lambs were marked, usually about the 1st July, and the monthly weighings usually commenced with the performance of that operation. The outstanding feature of these results is again the increased weights recorded for lambs by Dorset Horn rams and for Border Leicester x Merino ewes, though the difference is hardly so pronounced as at Wagga.

Bathurst Experiment Farm, 1913 to 1919 (inclusive)—Average Weights.

| Breed of Lambs. | No. | First Weighing. | | Second Weighing. | | Third Weighing. | | Fourth Weighing. | | Average Increase after First Weighing. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb. | oz. | lb. | oz. | lb. | oz. | lb. | oz. | lb. | oz. |
| $D_1L_1M$ | 81 | 29 | 7 | 41 | 6 | 55 | 11 | 65 | 3 | 11 | 14 |
| $D_1L_2M$ | 85 | 29 | 13 | 42 | 2 | 56 | 14 | 65 | 9 | 11 | 14 |
| $D_1L_3M$ | 90 | 29 | 8 | 43 | 9 | 57 | 5 | 68 | 5 | 12 | 15 |
| $D_2L_1M$ | 89 | 28 | 10 | 42 | 0 | 56 | 2 | 65 | 1 | 13 | 2 |
| $D_2L_2M$ | 74 | 27 | 9 | 42 | 8 | 56 | 2 | 67 | 5 | 13 | 4 |
| $D_2L_3M$ | 69 | 27 | 15 | 41 | 3 | 55 | 0 | 66 | 0 | 12 | 11 |
| $D_5L_1M$ | 81 | 31 | 4 | 45 | 6 | 61 | 0 | 71 | 1 | 13 | 4 |
| $D_5L_2M$ | 87 | 31 | 7 | 45 | 5 | 60 | 8 | 71 | 1 | 13 | 3 |
| $D_5L_3M$ | 84 | 29 | 8 | 42 | 14 | 58 | 1 | 69 | 13 | 13 | 7 |

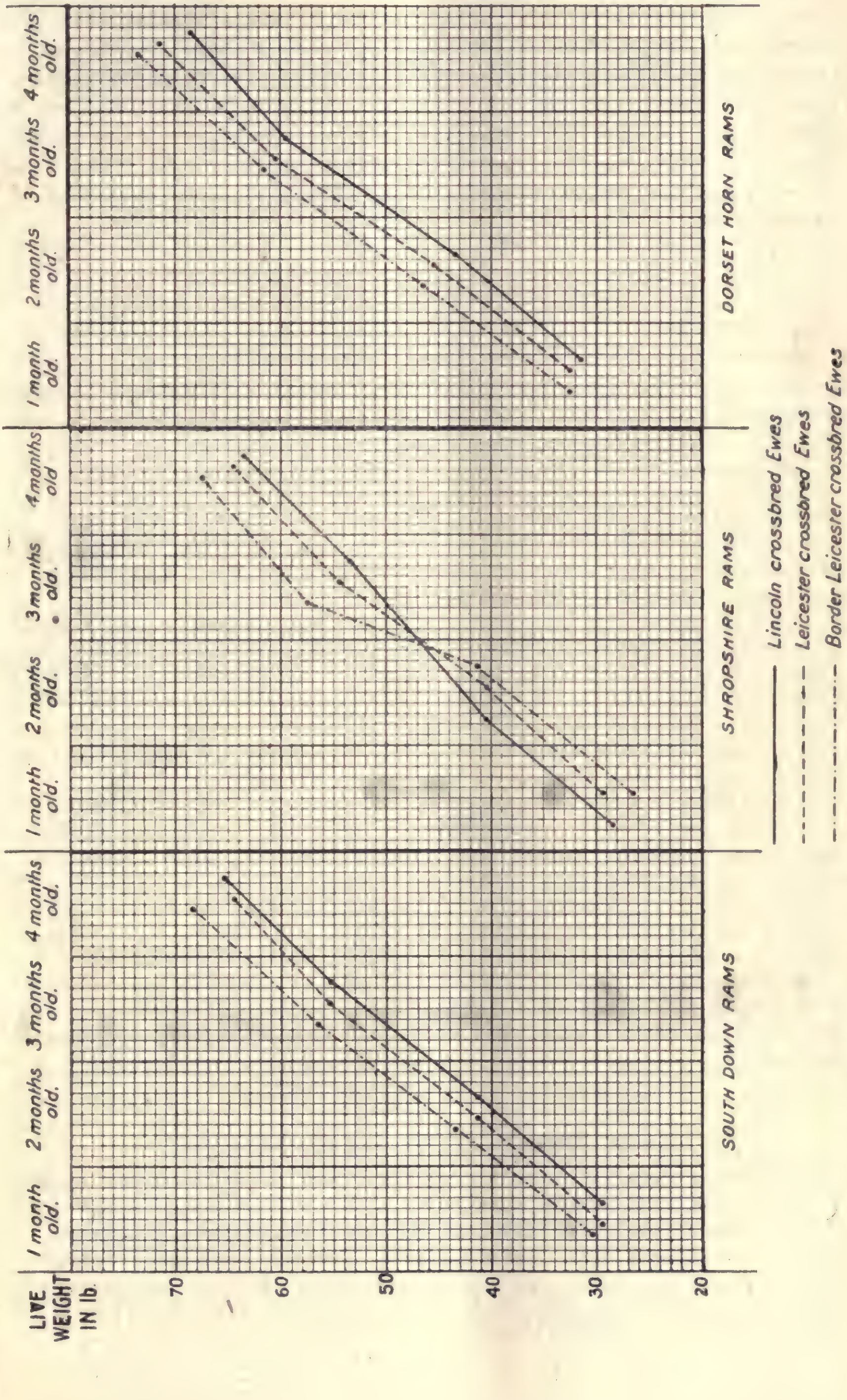
The period of mating in this case occupied about six weeks, dating from the middle of January. The lambs were marked about the last week in July, and the later mating period was the probable consequence of the higher percentage of lambs recorded for all breeds at this time. The Dorset Horn rams once more headed the list with the greatest gain.

TABLE II—Combined Averages of Monthly Weighings at Wagga, Cowra, and Bathurst Experiment Farms.

| Breed of Lambs. | No. | First Weighing. | | Second Weighing. | | Third Weighing. | | Fourth Weighing. | | Average Increase after First Weighing. | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb. | oz. | lb. | oz. | lb. | oz. | lb. | oz. | lb. | oz. |
| $D_1L_1M$ | 256 | 29 | 7 | 41 | 9 | 55 | 11 | 65 | 0 | 11 | 14 |
| $D_1L_2M$ | 289 | 29 | 11 | 41 | 5 | 55 | 2 | 64 | 13 | 11 | 11 |
| $D_1L_3M$ | 306 | 30 | 11 | 43 | 2 | 56 | 7 | 68 | 0 | 12 | 7 |
| $D_2L_1M$ | 286 | 28 | 0 | 40 | 0 | 53 | 13 | 63 | 3 | 11 | 11 |
| $D_2L_2M$ | 277 | 29 | 3 | 40 | 6 | 54 | 6 | 64 | 10 | 11 | 13 |
| $D_2L_3M$ | 337 | 26 | 10 | 41 | 7 | 57 | 2 | 68 | 0 | 13 | 12 |
| $D_5L_1M$ | 273 | 31 | 15 | 43 | 11 | 59 | 0 | 68 | 9 | 12 | 3 |
| $D_5L_2M$ | 272 | 32 | 5 | 45 | 9 | 60 | 13 | 71 | 4 | 12 | 15 |
| $D_5L_3M$ | 306 | 32 | 5 | 46 | 8 | 61 | 4 | 73 | 12 | 13 | 13 |

The results show a marked consistency in respect of both ewes and rams. The Dorset Horn breed of ram outstrips both the others in respect of body weight from all strains of ewes, while the Border Leicester x Merino ewe is again on top when compared separately with each breed of ram at the final weighing.

Taking the rate of development from the three groups of ewes conjointly, we find that the Dorset Horn ram is practically 1lb. more rapid in development than the South Down, and 9 oz. quicker than the Shropshire. These results are in entire agreement with the physical characters of the breeds employed.




Graph showing development of the lambs of the three breeds of shortwool rams when crossed on the three longwool crossbred ewes.

What now remains to be proved is whether the heavier body and coarser flesh of the Dorset Horn crosses are as valuable in the aggregate as the lighter carcase but superior flesh of the South Down, or whether the Shropshire is more valuable than either. For this information readers must be referred to further tables giving the weights of the different crosses at the time of marketing, and also the prices which they fetched. That phase of the investigation will form a separate part of this article for next month. Meantime the accompanying graphs illustrate the monthly development of the various combinations.

(*To be continued.*)

## A Co-operative Sheep Dip.

Co-operatively-owned sheep dips are fairly common in Victoria, but one started in South Australia in 1917 by the Riverton branch of the Agricultural Bureau has interest for members of the Bureau in New South Wales.

The dip was financed by floating shares at £1 each, the minimum subscription being £1 and the maximum £5. Approval was obtained for the erection of the dip on a Government water reserve, which was proclaimed a reserve for the purpose, without rent to the society. The plans for the construction of the dip were supplied by the Department of Agriculture, and the total cost of erection was £109 8s.

The management is vested in a committee of nine, including secretary and manager. The manager prepares the dip, assists in the dipping, and notifies owners when to bring their sheep in; and he is paid according to the time he is employed. The company supplies the dipping solution, and the owners of the sheep supply the labour, it being customary for owners to assist each other. Members are charged one penny per head, and non-members £1 for the first hundred, and 12s. 6d. for each additional hundred.

In the first year, 1917–18, as a result of dipping 6,726 sheep, the credit balance at the end of the season was £3 1s. 4d. In 1918–19, 15,680 sheep were dipped, and the balance was £20. In 1919–20, 14,441 sheep were dipped, and the credit balance was £60.

At the outset the scheme met with considerable opposition from some local farmers who declared they could dip more cheaply privately; but at a later stage these farmers applied for and obtained permission to use the dip.

After interest at current rates has been paid to subscribers, a refund to members, on the basis of the number of sheep dipped, will materially reduce the actual cost of dipping.—C. C. Crane, Organising Inspector of Agricultural Bureau.

## Basic Super and Superphosphate.

The difference between superphosphate and basic super lies in the greater solubility and consequently more rapid action of the former. Both substances contain considerable quantities of lime in the form of phosphate of lime and sulphate of lime. Basic super will probably be found more beneficial on soils inclined to be sour. If it is desired to combine the rapid action of the superphosphate with the more lasting effects of the basic super, the two can be mixed.—F. B. Guthrie.

# Grading New South Wales Wheats.

## The Proposed Standards.

E. HARRIS, Executive Member and Secretary, Wheat Grading Committee.

With the change from handling wheat in sacks to handling it in bulk, the necessity arises of introducing a proper method of grading wheat on class, quality and condition, such as is done in other great wheat-producing countries. In the July, 1919, issue of the *Agricultural Gazette*, under the head of "Wheat Grading in America," the writer described the classifications and methods in operation in Canada and the United States. For the purpose of carrying out the preliminary investigations and advising the Government, the following have been appointed as a Wheat Grading Committee:—Messrs. Geo. Valder, T. Wise, F. A Crago, M. McLeod, A. K. Trethowan, F. J. Wallis, G. W. Walker, J. S. Cameron, W. A. McRitchie, E. Field, J. Fitzpatrick, and E. Harris.

At the last meeting of this committee the writer proposed certain standards of grading as a basis for discussion, and this proposal is being put before various interests concerned by members of the committee. Details of these proposed standards are now published for the purpose of inviting criticism and suggestions from farmers and others interested. They are as follows:—

Class 1. *Australian Hard Red Wheat.*—This class to include wheat of varieties Cedar and Marquis.

Class 2. *Australian Hard White Wheat.*—This class to include wheat of varieties Comeback, Bobs, and Hard Federation.

Class 3. *Australian White Wheat.*—This class to include wheat of varieties John Brown, Haynes' Blue Stem, Florence, Rymer, Bunyip, Marshall's No. 3, Sunset, Thew, Purple Straw, Zealand, Yandilla King, Bomen, Firbank, Cleveland, Federation, Steinwedel, and Warren.

There are, no doubt, other varieties of wheat containing similar characteristics to the foregoing; each of these would have to be included in the class to which it belonged. Each of these classes is divisible into five grades, and the No. 1 grade is so arranged as to include wheat which would come within the fair average quality grade that has obtained during the past ten years. Following are the requirements of each grade:—

*Premium A1.*—Minimum test weight per bushel, 65 lb.; maximum moisture content, 12·5 per cent.; maximum percentage of damaged kernels, 2 per cent.

*Premium B.*—Minimum test weight per bushel, 63 lb.; maximum moisture content, 13 per cent.; maximum percentage of damaged kernels, 2 per cent.

*No. 1 Grade.*—Minimum test weight per bushel, 60 lb.; maximum moisture content, 13 per cent.; maximum percentage of damaged kernels, 3 per cent.

*No.* 2 *Grade.*—Minimum test weight per bushel, 58 lb.; maximum moisture content, 13·5 per cent.; maximum percentage of damaged kernels, 4 per cent.

*No.* 3 *Grade.*—Minimum test weight per bushel, 56 lb.; maximum moisture content, 13·5 per cent.; maximum percentage of damaged kernels, 7 per cent.

Wheat of the five grades of each class must be sound, cool, and sweet, free from live weevil or other insects injurious to stored grain, and any commercially objectionable odour. Wheat of grades Premium A, Premium B, and No. 1 must also be bright in appearance. As explained above, most of our shipping wheat would come under the description of No. 1 Australian White Wheat.

### Setting the Grades.

It is just as important to see that a representative sample of the grain to be tested is taken as to test the grain to determine the grade to which it is to be allotted. Samples of 1 or 2 oz. in weight are of no use for this purpose, and under the proposed grading system it will be specified that samples shall be at least 4 lb. in weight, and shall be truly representative of the bulk of the parcel to be tested. Should there be any reason to suspect that the moisture content is higher than that allowed, a sample of at least 1½ lb. shall be enclosed in a clean, air-tight container, for the purpose of having the moisture content ascertained by a moisture tester.

Wheat which when freed from dockage contains more than 10 per cent. of other grain will not be entitled to a grading as wheat. The dockage shall be determined by means of sieves or other approved mechanical means, and if it exceeds 1 per cent. of the whole, such percentage shall be deducted from the weight of the grain. Dockage shall mean sand, dirt, weed seeds, weed stems, chaff, straw, grain other than wheat, and any other material which can be removed readily from the wheat by use of appropriate sieves or other approved mechanical means, and shall be calculated in terms of percentage based on the total weight of the grain, including dockage. If less than 1 per cent., the dockage shall be ignored. A fraction of a percentum shall also be ignored.

The test weight per bushel shall be determined by an approved testing apparatus, and the method of use is to be approved and described.

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## Modern Farm Practice.

What has the farmer learned in these fifty years . . . ? He has learned that the soil is not a sullen, lifeless thing, only useful as a standing place for his crops, but that it is rather to be likened to a farm animal and valued accordingly. . . . Practically all that we know regarding the bacterial life of the soil is a harvest of the last fifty years. The formation of humus in the soil, the solution of plant food from the soil minerals, the conversion of nitrogenous materials into forms which the crop can utilise, and the gathering of free nitrogen from the air—these are the great functions of the soil bacteria. Much remains to be learned of their nature and their needs . . . . but what we know already is coming into common farm knowledge and having its effect on farm practice.—Dr. E. H. Jenkins, Connecticut, U.S.A.

# The Culture of Sugar Cane in New South Wales.

A. H. HAYWOOD, Manager, Wollongbar Experiment Farm.

It has so long been accepted as a *sine qua non* of sugar cane-growing in New South Wales that the area should be on the decline, that it is quite refreshing to find an increased interest in the crop and in certain quarters a confidence that some of the ground lost in the last decade is likely to be re-occupied. The factors that most largely enter into this improved outlook are, of course, the improved price offering for cane, and the fact that the shortage in the world's stocks of sugar cannot be overtaken for some years. Consideration of the subject on its practical side, too, provokes the feeling that any improvement that may take place need not be a brief reaction coincident with high prices, but that a permanent establishment of the industry on the solid basis of regular and reasonable profits should be possible. The cane-grower has to meet competition of a character that the more important crops of the State are free from, and he can only do it by the adoption of such methods of culture as will give him substantially heavier and more profitable crops than his competitors.

One cannot but be impressed with the fact that the cane-grower on our northern rivers—excellent farmer as he is in many ways—is neglecting methods that would make for better and more profitable crops. Good cultivation and selection of the best "seed" from disease-free plants are things the cane-grower is by no means ignorant of. Indeed, he will lay down in definite terms the value of rotation and tell you that cane should not be planted immediately after an old stand has been ploughed out; he will enlarge on the value of cowpeas, and point out that maize is a very useful change crop for cane land—but put these excellent doctrines into practice it is to be feared he does not. Even the importance and value of careful selection of his "seed" from stools free from disease the grower knows something about, but one hesitates again to believe that he pays the attention he might do to such sound principles when it comes to the commonplace business of collecting the canes for purposes of propagation. Obviously diseased plants are no doubt avoided, and to some extent weak and run-out stools; but serious, careful selection in accordance with undeniable indications of health and virility is lacking in all but the very best farmers.

## The Statistics of the Industry.

It must not be imagined from the foregoing that while cane-growing has been decadent in New South Wales, the importance of maintaining the product per acre and the percentage of commercial sugar has been altogether lost sight of. Statistics show that the area devoted to sugar cane in New South Wales reached its maximum in the season 1895-6,

when the total was nearly 33,000 acres. From that date there was a steady decline, until in 1917-18 it was only 10,722 acres. Coincident with this decrease, however, there has been a steady improvement in the production per acre, for whereas in the nine seasons 1901 to 1910 the yield remained practically constant at 21 tons per acre, the average has latterly shown an upward tendency, and in the ten-year period 1908 to 1918 the average was 26·38 tons.

The same improvement is apparent in the yield of sugar per acre, for whereas in the earlier years of the industry it ran rather under 2 tons, in the ten seasons 1908 to 1918 it averaged 3·05 tons per acre. The improvement in the sugar content of the cane can be indicated in another way. The Government Statistician tells us that in years gone by approximately 10 tons of cane were required to produce 1 ton of sugar, but in the decade to 1918 only 8·65 tons of cane were required to give the same quantity of sugar. These indications of improvement can be regarded with sincere satisfaction, and without one whit abating the reservations already made as to the necessity for employing the best and soundest methods.

### The Soil and Climate Necessary to Sugar Cane.

For profitable production, sugar cane requires a deep rich soil that is capable of supporting a heavy vegetative growth for a number of years, a warm atmosphere, and a substantial rainfall. The soil should be porous and friable without being sandy, and it should be thoroughly well drained, either by reason of a suitable subsoil or of the natural fall. The temperature should not only be mild, but there must be freedom from frost, and the rainfall should be well distributed throughout the year. The belief that sugar cane flourishes best near the sea because the saline particles conveyed by the wind are congenial to the plant may be well founded, but perhaps better reasons for the exuberant growth near the sea are the moisture that accompanies a sea breeze even in the driest weather, and the freedom from frost that the sea ensures.

The North Coast of New South Wales affords all these conditions, frost being the chief controlling agent and responsible for much of the contraction in area that took place in years gone by. The beautiful broad sheets of water of the Clarence, Richmond, and Tweed rivers, as they approach the sea, combine with their many creeks and channels to modify the temperatures and thus prevent frost, and at the same time to afford cheap freight for a bulky crop that otherwise might be costly to handle.

The conditions on the three rivers thus have strong resemblances, but they also have important points of distinction, and on each river the grower has his own peculiar difficulties, expressed perhaps most particularly in the differences between the varieties chiefly grown on each river.

### The Clarence River Districts.

On the Clarence River the rainfall is lighter than on either of the other rivers, and good cultivation together with the maintenance of the humus content—two factors of universal significance where moisture is apt to be

deficient—are essential. For the most part the soil is of deep alluvial formation, but in parts it is more of a fine sandy loam. In parts the fields are a very few feet above river level, but still well drained, whereas in others they are so low as to demand systematic drainage; in fact, there are farmers on this river with whom drainage is such a material consideration as to be their chief business.

The prospects of an extension of the area on this river cannot be said to be very great. Frost is a strictly limiting factor, and production is confined to the banks of the river and its many creeks and channels. At the same time, the improved prospects will no doubt bring once more under

Sugar Cane at Chatsworth Island, Clarence River.
A heavy crop of Badila.

cane many acres that in recent years have been diverted to dairying. Indeed, one of the most profitable means of renovating land that has been over-cropped is by putting it under grass for a few years, and some of the most successful growers owe a good deal to their combination of sugar cane with dairying. The method adopted by some is to allow couch grass to take possession of the land after ploughing the cane stools out, and simply to graze the pasture without further treatment, while others have found that perennial rye grass and clover sown in autumn on the ploughed land quickly take possession in a fair season and form a fine sward. When, in a few years such ground is broken up again, it generally responds well to sugar cane.

Under the influence of present prospects land is bringing high prices on the Clarence. As much as £150 per acre is said to have been paid quite lately for first-class cane land near Maclean, and there is not lacking evidence that though there cannot be the development here that may be anticipated on the other rivers, the shrinkage in area that has resulted from the last two planting seasons being excessively dry, is likely to be recovered in the present season should it be at all favourable.

**Sugar Cane at Palmer's Channel, Clarence River.**

A good crop of New Guinea No. 16.

### The Richmond River Districts.

On the Richmond the area devoted to sugar cane is much larger than on either of the other rivers. Considerable areas from Woodburn upwards have had to be abandoned owing to frost, but below that town there is a goodly area that is either frost-free or nearly so whereon sugar cane can be grown with profit, and that, in fact, is already attracting attention on this account. The configuration of the country favours the Richmond for cane-growing in a quite peculiar way. The tendency of the North Coast rivers to take a northerly course for some miles before falling into the ocean is most emphatic in the case of the Richmond. For perhaps 15 miles it runs parallel with the coast, only a narrow neck of land separating it from the sea. Thus, with the mountains a distant protection on the west, the

river close at hand, and the ocean only a mile or so away, the strip of highly fertile land that separates the river from the sea has such favourable conditions for this crop as exist hardly anywhere else in Australia. The alluvial flats along either bank of the river are well suited to cane, but further back are many acres of tea-tree scrub with a black soil, rich in organic matter, and a few inches or more deep, resting on a bed of clay that in turn rests on pure sand. The area of this formation is extensive, commencing not far from Ballina, and reaching up to and beyond Broadwater. In parts the tea-tree runs up tall and straight—the evidence of excellent soil—and where this is being felled and brought under cane, £80 is mentioned as a sum for which an owner would not readily sell. Though not quite on the banks of the river, the tempering influence of sea and river are sufficient insurance against frost. Drainage is essential to success on these lands, for they are low and often almost without fall. In places drains 10 feet to 14 feet wide have already been cut, but it is obvious that such high-priced land is going to be held in small blocks, and the construction of the drains must therefore be accomplished by some local authority, or by the co-operation of the owners. The Colonial Sugar Refining Company already has schemes for the drainage of extensive areas of these lands, and should they be proceeded with the effect on the industry on the Richmond is certain to be expansion.

The effect of excessive moisture on sugar cane could hardly be better illustrated than by the crushing figures of the Broadwater mill for the last three seasons:—

In 1917, 83,000 tons of cane were crushed.
In 1918, 30,000 tons of cane were crushed.
In 1919, 37,000 tons of cane were crushed.

This startling decline is connected by the company's officers at the Broadwater mill with two very wet seasons. The young plants are always very sensitive to bad drainage and never seem to recover fully, and in the seasons 1916 and 1917 they were nearly drowned out, the effect upon the crushing being indicated when the crops reached maturity two years later. That a remedy is within reach for supersaturation of the soil has already been indicated.

Apart from the tea-tree forest, much of the land suitable for sugar cane is already under crop, but where dairying has displaced it for the time being there is no reason to doubt that the crop will gradually come to its own again, and it should be years before the Richmond loses pride of place in New South Wales in the matter of area under cane.

In the matter of yield, the Broadwater mill claims for its district the honor of the highest average yield per acre among all the company's mills, though in this respect the Richmond cane has the advantage of two years' growth as against eighteen months' growth in some of the Queensland districts. Last year Broadwater was also amongst the company's best in the matter of quality of cane crushed. The new planting this year should exceed 2,000 acres,

which is larger than for many years. "The average crop on this river should be 40 tons per acre for plant crop, and 30 tons for ratoon crop," said an officer of the company lately, "but owing to the presence of diseases and bad drainage it only ranges, according to the season, from 17 to 30 tons."

### The Tweed River Districts.

Turning to the Tweed River, where the climate is warmer and the rainfall much greater than on either of the other rivers, we find that sugar cane is still grown to some extent on the alluvial soils along the banks of the river, but by far the largest area devoted to the crop is located on undulating land with deep red volcanic soil of very fertile quality, situated a mile or two from the sea and perhaps 100 feet or so above sea-level. The frost question on the Tweed is thus settled either by proximity to the river or by a sufficient elevation between the sea and the river. The prospects of extension on this river are by no means negligible. The river banks themselves may well contribute a good many acres, even though frost marked the limit pretty clearly in other years. On the Cudgen area, too, the available area is still capable of expansion, and it may even be expected that some land planted in late years to bananas will presently revert to sugar cane. But the principal development on this river is likely to be on an extensive area of peaty, low-lying land at Mooball, some miles south of the river, but close to the sea. Here there are hundreds of acres of deep peaty soil from which the heavier timber has already been removed, and which only requires cleaning up and systematic drainage to become highly productive. One has only to mention the name of this area on the Tweed to be assured that it will in a few years be carrying many acres of heavy crops of cane.

The bulk of the present production of cane on this river, however, is on the Cudgen area. Here the rich volcanic soil is for the most part thickly strewn with stones of all sizes. A number of farmers have cleared their land of the larger stones at an expense varying from £20 to £30 per acre, and consider the outlay fully justified by the fact that they can now cultivate their land with horse-power instead of by hand. There are those, on the other hand, who declare that the stones prevent the evaporation of the moisture from the land, and actually contribute plant-food by yielding necessary elements in solution to the soil; the heavy crops grown, the ease with which the seed is mattocked into the ground between the stones, and the saving of labour in that practically no cultivation is necessary, certainly do offset in part the advantages that would be gained by clearing the land of the stones.

How productive is the land on this area one has only to see to realise. Recent years have seen an extension of cane on to certain lands for years devoted to dairying, and the 60 and 70-ton crops that the purchasers have since harvested have enabled them to pay off in a very short time the £30 per acre they paid for their farms. Certainly they would not get the land to-day for the same money.

On the Cudgen area are situated some thirty-two farms, averaging 50 acres each. Last year the product of the area was 22,000 tons of cane, and the wages paid for cutting to all so employed was £9,500—clear proof of the value of the industry as a wage-paying one.

### The Costs of Clearing, Planting, and Harvesting.

Before proceeding to deal more fully with the methods of cultivating sugar cane, it will be useful perhaps to give some idea of the cost of clearing land in those districts where new areas are being brought under the crop.

As to the tea-tree forest that stretches from Pimlico to Ballina on the Richmond, some idea is afforded by the experience at Wollongbar Experiment Farm, where partly cleared country that still carried some green timber cost £14 per acre to clear for the plough. On the heavier tea-tree timber further up the river, clearing would not be done for less than £20 per acre.

An approximation of the initial outlay and probable return is afforded by the following figures which were made available by a farmer who had cleared and planted an area of rough virgin scrub land, where all the work had to be done by hand:—

| | | |
|---|---|---|
| Felling ... ... ... ... ... | £3 | per acre. |
| Burning off ... ... ... ... | 5 | ,, |
| Holing ... ... ... ... ... | 4 | ,, |
| Plants ... ... ... ... ... | 4 | ,, |
| Planting .. ... ... ... ... | 2 | ,, |
| | £18 | ,, |

Thus, the crop planted had cost this farmer £18 per acre. Pursuing his figures, we may add the following:—

| | | |
|---|---|---|
| Weeding (four chippings) ... ... ... ... ... | £12 | per acre. |
| Cutting (7s. 6d. per ton for 40-ton crop)... .. ... | 15 | ,, |
| Hauling cane to punts (5s. per ton) ... ... ... | 10 | ,, |
| | £37 | ,, |

The total outlay on the crop at this stage was £55, against which must be set a return of 40 tons of cane at £2 per ton—or £80 per acre. Such a stand would, of course, be left for a ratoon crop, and the outlay, in view of the second cut, would be:—

| | £ | s. | d. |
|---|---|---|---|
| Chipping ... ... ... ... ... ... | 10 | 0 | 0 |
| Cutting (7s. 6d. per ton for 30-ton crop) ... ... | 11 | 5 | 0 |
| Hauling cane to punt (5s. per ton) ... ... ... | 7 | 10 | 0 |
| | £28 | 15 | 0 |

The 30-ton crop at £2 per ton would leave such a grower in a good position as to his sugar cane, and a second ratoon crop would further improve matters, as the following shows:—

| | £ | s. | d. |
|---|---|---|---|
| Chipping... ... ... ... ... ... ... | 10 | 0 | 0 |
| Cutting (7s. 6d. per ton for 25-ton crop) ... ... | 9 | 7 | 6 |
| Hauling cane to punt (5s. per ton) ... ... ... | 6 | 5 | 0 |
| | £25 | 12 | 6 |

With £2 per ton for 25 tons per acre, the farmer now shows a reasonable return for his outlay and labour, which we may present thus:—

| *Dr.* | £ | s. | d. | *Cr.* | £ | s. | d. |
|---|---|---|---|---|---|---|---|
| Felling timber, clearing land, and planting cane ... ... ... | 18 | 0 | 0 | First crop, 40 tons per acre at £2 ... ... ... | 80 | 0 | 0 |
| Cultivating, cutting, &c., on first crop | 37 | 0 | 0 | First ratoon crop, 30 tons | 60 | 0 | 0 |
| Cultivating, cutting, &c., on first ratoon crop ... ... ... | 28 | 15 | 0 | Second ratoon crop, 25 tons | 50 | 0 | 0 |
| Cultivating, cutting, &c., on second ratoon crop ... ... ... | 25 | 12 | 6 | | | | |
| | £109 | 7 | 6 | | £190 | 0 | 0 |

The above makes no charge for the interest on the capital value of the land, or for the farmer's salary as manager, though, of course, it includes any labour he may have supplied himself.

(*To be continued.*)

## The Influence of the Tractor on the Use of Horses.

The influence that the introduction of tractors had upon the employment of horses on 191 farms in the maize-belt of the United States was made the subject of investigation by the United States Department of Agriculture, and the results have been collected and presented in *Farmers' Bulletin* 1093.

The results of the inquiry may be summarised thus:—

On 141 farms (averaging 346½ acres), on which tractors had been used for a year or over, the number of horses disposed of averaged two and a half per farm.

The average number of acres tilled per horse increased from 26½ to 38½ after the purchase of the tractor.

Nine farmers out of 191 had displaced horses entirely on ploughing, disking, and harrowing.

Only sixteen farmers allowed their horses to stand idle while the tractor was in use.

The number of horses displaced by the tractors on the farms was governed by the number it was necessary to retain for maize cultivation and other work current at the same time, which the tractor could not do.

The horses remaining on the farms are doing about 75 per cent. of the tractive work and tractors the remainder.

The tractor was used for an average of twenty-nine days of ten hours each on the home farm.

A three-plough tractor on these farms does the work of eight and a half horses in ploughing, disking, harrowing, and harvesting.

After the purchase of the tractor, the average size of the farms was increased by 22 acres, or 6⅓ per cent.

The principal advantage of a tractor is its ability to do heavy work in a shorter time than it can be done with horses.

# Farmers' Experiment Plots.

## POTATO EXPERIMENTS, 1919-20.

### Upper North Coast District.

W. D. KERLE, Inspector of Agriculture.

VARIETY and manurial experiments with potatoes were conducted during the season 1919-20 in co-operation with the following farmers:—

Henry Short, "Warrawee," Dorrigo.
Frank Allard, "Glenrose," Brooklana, Eastern Dorrigo.
James Wilson, Coramba.
Albert Eggins, "Bromley," Grafton.
E. N. Mackinnon, Lawrence.
G. P. Collins, "Colindale," Casino.
D. Chisholm, Kyogle.

Results were obtained from all these centres with the exception of Casino and Kyogle, where the crops were complete failures owing to the drought which prevailed—the worst in the history of the district. The successful plots supply data for the Clarence and Orara rivers district and the Eastern Dorrigo and Dorrigo plateaux. These districts vary widely both meteorologically and in soil characteristics, and these variances explain the big differences in yields. The differences were very marked last year, the upper North Coast generally experiencing a drought of unprecedented severity, while on the Dorrigo (2,800 feet above sea-level) a heavy rainfall was recorded.

The accompanying table shows the rainfall records of each centre during the growing period of the crop. The figures reflect the dryness of the important months for high yields of potatoes in the rivers district and are sufficient evidence of the adverse nature of the season. Temperatures, too, were very high, and falls of rain of less than an inch were not of much material value to the crop, being rapidly dissipated by the hot drying winds which invariably followed.

TABLE showing Rainfall during Growing Seasons.

| Month. | Dorrigo. | Brooklana. | Coramba | Grafton. | Lawrence. |
|---|---|---|---|---|---|
| 1919. | Points. | Points. | Points. | Points. | Points. |
| August ... ... | Nil. | Nil. | 17 | 19 | ...... |
| September ... | Nil. | Nil. | Nil. | 14 | Nil. |
| October ... ... | 348 | 361 | 138 | 111 | 119 |
| November ... | 287 | 274 | 232 | 231 | 25 |
| December ... | 507 | 528 | 520 | 96 | 4 |
| 1920. | | | | | |
| January ... ... | 1,296 | 1,163 | ...... | ...... | ...... |
| Total ... | 2,438 | 2,326 | 907 | 471 | 148 |

The germination of the plots was excellent throughout, a result due to the use of good seed combined with a sufficiency of soil moisture, obtained by thorough preparation of the soil and consequent conservation of the previous summer and autumn rains. Irish blight did not make its appearance in any of the plots, owing, no doubt, to the prevailing high temperatures and lack of humidity in the atmosphere. It is said that no spores of this fungus are formed below 40 deg. Fah. and above 78 deg. Fah., and that they are most active at 72 deg. Fah.; it is possible, therefore, that only rarely will the spring crop in the upper North Coast be affected provided the seed is clean. On the other hand, the autumn crop is very likely to be attacked by the fungus; as a matter of fact, it almost invariably is attacked, and very few farmers at present take the risk except in very small areas.

### RESULTS of Potato Variety Trials.

| | H. Short, Dorrigo. | F. Allard, Brooklana. | J. Wilson, Coramba. | A. Eggins, Grafton. | E. N. Mackinnon, Lawrence. |
|---|---|---|---|---|---|
| Date sown .. .. | 7–9 October. | 8–9 September. | 19–20 August. | 24–26 August. | 5–6 September. |
| Effective rainfall .. | 24·38. | 23·26. | 9·07. | 4·71. | 1·48. |
| | t. c. q. | t. c. q. | t. c. q. | t. c. q. | t. c. q. |
| Langworthy ... | 12 10 2 | ...... | 4 14 2 | 2 11 2 | ...... |
| Factor ... ... | 12 3 0 | 7 8 2 | 5 19 2 | 3 0 2 | 0 15 1 |
| Up-to-Date... ... | 12 0 1 | 7 14 3 | 5 16 2 | 2 15 0 | 0 16 0 |
| Plunkett's ... ... | 11 19 3 | ...... | ...... | ...... | ...... |
| Carman No. 1 ... | 10 18 2 | 6 6 0 | 6 12 0 | 3 6 3 | 1 2 0 |
| Coronation ... ... | 10 2 1 | ...... | ...... | ...... | ...... |
| Brownell's Beauty .. | 10 1 0 | 6 4 2 | 4 5 0 | 2 0 2 | 0 8 1 |
| Queen of the Valley | 10 0 2 | 6 11 1 | ...... | ...... | 0 15 1 |
| Early Manistee ... | 9 9 2 | 5 1 3 | 1 18 0 | 0 18 2 | ...... |
| Manhattan ... ... | 9 6 2 | 6 5 2 | 2 4 0 | 1 13 0 | 1 0 1 |
| Surprise ... ... | 8 10 3 | 5 8 1 | 2 4 3 | 0 14 2 | ...... |
| Premier ... ... | 8 3 0 | 4 18 1 | 1 5 0 | ...... | 0 4 3 |
| Satisfaction ... | 6 0 2 | 6 18 3 | 1 8 1 | 1 9 1 | 0 5 0 |
| New Era ... ... | 5 15 0 | ...... | ...... | 1 9 2 | ...... |

### RESULTS of Potato Manurial Trials.

| | H. Short, Dorrigo. | F. Allard, Brooklana. | J. Wilson, Coramba. | A. Eggins, Grafton. | E. N. Mackinnon, Lawrence. |
|---|---|---|---|---|---|
| Variety. | Queen of the Valley. | Factor. | Factor. | Manhattan. | Carman No. 1. |
| | t. c. q. | t. c. q. | t. c. q. | t. c. q. | t. c. q. |
| Superphosphate 3 cwt. per acre ... | 10 12 1 | 6 18 2 | 5 19 2 | 1 9 2 | 1 6 3 |
| Superphosphate 2 cwt. per acre ... | 10 0 2 | 6 3 3 | ...... | 1 5 3 | 1 5 0 |
| P5* 2½ cwt. ... ... | 10 0 1 | 7 1 2 | 5 18 3 | 1 13 0 | 1 7 0 |
| P7* 3 cwt. ... ... | 9 16 0 | 7 11 2 | 6 9 0 | 2 7 3 | 1 6 0 |
| P8* 3 cwt. ... ... | 9 14 3 | 5 17 2 | 5 10 0 | 1 2 0 | 1 1 2 |
| No manure ... ... | 7 17 3 | 4 10 2 | 5 3 2 | 0 11 1 | 1 1 3 |

* The mixture P7 consists of equal parts of superphosphate and bonedust; P5 of superphosphate 4 parts, sulphate of potash 1 part; and P8 of equal parts of superphosphate and blood and bone.

The manurial trials, it will be noticed, all show substantial increases by the use of artificial fertilisers. The greatest increases in yield were obtained from the use of P7, which contains 19·5 per cent. phosphoric acid and 1·85 per cent. nitrogen. This fertiliser has given remarkably consistent results with potatoes, maize and winter fodders in departmental trials on the coast. The following table shows the value of the increased yields due to fertilisers :—

| Locality. | Greatest increase due to fertiliser. | Kind of Fertiliser. | Approximate Total Cost per acre. | Ruling Market Price at harvest time. | Nett Increase. |
|---|---|---|---|---|---|
| | t. c. q. | | £ s. d. | | £ s. d. |
| Dorrigo ... | 2 14 2 | Superphosphate, 3 cwt. | 1 15 0 | £15 per ton. | 39 2 0 |
| Brooklana... | 3 1 0 | P7, 3 cwt. per acre ... | 2 0 0 | £15 ,, | 43 15 0 |
| Coramba ... | 1 5 2 | P7, ,, ,, ... | 1 15 0 | £30 ,, | 36 10 0 |
| Grafton ... | 1 16 2 | P7, ,, ,, ... | 1 10 6 | £30 ,, | 53 4 6 |
| Lawrence ... | 0 5 1 | P5, 2½ cwt. ,, ... | 1 15 0 | £30 ,, | 36 2 6 |

The price of potatoes on the market was exceptionally good last season, and the profits from manuring, therefore, appear very high. In the above table the cost of fertiliser is a liberal estimate, including cost of fertiliser in Sydney plus freight and cartage. In the first three cases these additional costs were considerable. It will be seen that the market price of potatoes would have to be very low for the application of fertilisers to be a losing proposition.

### Varieties.

All the varieties under trial are more or less well known, with the possible exception of Premier and New Era. These varieties have been introduced into coastal variety trials recently on account of their reputed resistance to Irish blight, but the disease did not make its appearance during the last two seasons, hence no data is available. They have both yielded so poorly in all trials that even if they prove disease-resistant they cannot be regarded as profitable coastal varieties for spring planting.

The only disease noticeable in any variety was what is commonly known as "milky eye," and this appeared in the plot of New Era at Dorrigo, where almost 50 per cent. of the tubers were affected.

Premier is a late maturing variety with smooth pink skin, and of similar shape to Early Rose.

New Era is a white rough-skinned late maturing variety, round in shape and with fairly deep eyes.

### The Plots.

*Dorrigo.*—Soil, red volcanic, typical of the better class land of the plateau ; site first cultivated four years ago ; previous crop maize, which was harvested late, allowing of only one ploughing (a month before planting) to prepare for potatoes. Sown 7th to 9th October, 1919 ; drills 2 feet 7 inches apart, sets dropped every 12 to 15 inches, pressed firmly into the loose soil with foot, and covered with succeeding furrow. Plots each one-sixth of an acre

The germination of all plots was excellent, and the subsequent growth of haulm remarkably luxuriant. Inter-row cultivation was carried out once, and hilling with the plough just prior to the crop coming into flower.

The season in this locality was an exceedingly good one, particularly when contrasted with that of the upper North Coast. The actual rainfall recorded from sowing to harvesting was 32·90 inches, but only 24·38 inches fell during the actual growth and development of the crop.

For the last three years the varieties tried here have shown marked consistency, Langworthy, Factor, Up-to-Date, Carman No. 1, Coronation and Plunkett's yielding very much in that order each year. The first four named are white-skinned varieties, which seem better suited than the pink or purple-skinned varieties to the basaltic soil of the Dorrigo.

**Manurial Trial with Potatoes at Dorrigo.**

This plot of Queen of the Valley was manured with superphosphate at 3 cwt. per acre and yielded 10 tons 12 cwt., as against 10 tons where only 2 cwt. superphosphate was used, and 7 tons 17 cwt. where no manure was used.

The increase here of 2 tons 14 cwt. 2 qrs. obtained from the use of 3 cwt. superphosphate per acre represents a big profit. It is certainly surprising that on the comparatively newly cultivated soils of the plateau the yields should be so augmented by the use of artificial manures, but such has been the case in trials with all classes of crops conducted by the Department on this farm for the last four years.

*Coramba.*—Soil alluvial, previous crop maize; ploughed twice and harrowed several times prior to planting on 19th and 20th August; drills 2 feet 7 inches apart, and sets 15 inches apart in rows.

The rainfall at this centre was very erratic and wholly inadequate for high yields. Very little of the total of 9·07 inches recorded during the growing period was of material benefit to the crop, and the season generally was one of the worst ever experienced in the district.

The Rutherglen bug made its appearance in the crop at an early date and did considerable damage, particularly to Early Manistee and Satisfaction, the yields of which suffered very much in consequence. Both these varieties have yielded excellently under normal conditions, and the loss due to the depredations of the bug is estimated this year at 3½ to 4 tons to the acre.

The germination of the plots was very satisfactory, the seed-bed being fairly moist, deep and friable. The after-cultivation of the crop consisted of harrowing just when the plants were up, several cultivations between the rows, and hilling at flowering stage. The growth of the haulm was greater than expected with so meagre a rainfall.

It will be noted that four white-skinned varieties head the list in the variety trial. These have been very consistent in the last three years' trials here, Factor, Up-to-Date, and Carman No. 1 occupying the premier positions each year.

The results generally from this locality are very satisfactory considering the trying conditions to which the crops was subjected. The soil benefited largely from early ploughing and the frequent stirring of the surface with harrows.

*Grafton.*—The soil here was a rich alluvial loam, typical of the Clarence banks. At sowing time, 24th and 26th August, it was in a fairly moist friable condition, being reduced to a fine tilth by deep ploughing immediately after the removal of early maize in April, and again just before planting, with several harrowings and cross-harrowings in the interim. The germination of all plots, with the exception of Surprise (which gave only a 75 per cent. germination), was all that could be desired, but the meagre and erratic rainfall (usually followed by strong, hot westerly winds) was responsible for considerable second growth, and it is remarkable that under the trying conditions tubers formed at all. The yields obtained, although small, were highly creditable.

The after-cultivation of the crop consisted of cultivation between the rows three times with the Planet Jr. implement, to conserve moisture rather than to control weed growth. It is evident that the plants benefited from this storage of moisture.

In the past the purple-skinned Manhattan has given the best results in variety trials, but this season it occupied sixth place, with four white-skinned varieties in the lead. This was due to the season, and would seem to indicate the superiority of the latter types for drought conditions.

Potato growing on the Clarence River is mainly for the production of early potatoes, and for this purpose sowing is usually completed by the end of July. The early sowing is often at the expense of proper cultivation, and very little attention is given to the maintenance of soil fertility by the incorporation of organic matter. It is agreed that potatoes always yield well in newly broken-up land on account of the decaying vegetable matter, but the importance of keeping up the supply of humus is not sufficiently realised. In this connection the practice of raking and burning the cornstalks in preparing the land for potatoes is, to say the least of it, a wasteful one.

*Brooklana, Eastern Dorrigo.*—Soil volcanic, free working, porous, of yellowish appearance and generally typical of the eastern plateau; previous crop oaten hay; the oat stubble was ploughed in on 1st August, and


**Variety Trial with Potatoes at Dorrigo.**

Brownell's Beauty yielded 10 tons 1 cwt., and Carman No. 1, 10 tons 18 cwt.

a second ploughing given at the end of the month. Experiments sown 8th and 9th September, 1919, on well-prepared land; drilled in, rows being 2 feet 9 inches apart, and sets 15 inches apart.

The season was, generally speaking, favourable, the precipitation of 23·26 inches being accompanied by normal temperatures.

The results of both the variety and manurial trials were largely uniform with previous years. The value of artificial fertilisers is well expressed by the following figures, which show the increases obtained in this locality over three seasons from the use of 3 cwt. of P7 mixture per acre:—

| | | |
|---|---|---|
| 1917–18 | ... ... | 5 tons 1 cwt. per acre. |
| 1918–19 | ... ... | 5 ,, 3 ,, ,, |
| 1919–20 | ... ... | 3 ,, 1 ,, ,, |

*Lawrence.*—Experiments sown 5th and 6th September; soil, light loam of medium fertility. The results of the trials were very poor, but considering that the rainfall recorded during growth (four months) was 1·48 inches, it is surprising that the crop was not a complete failure.

The results are not of very great value in the selection of varieties for main crop sowings, as the season was far from an average one. They are, however, of value in demonstrating the drought-resisting qualities of varieties and the action of fertilisers. Carman No. 1 appears to be an exceptionally hardy variety.

The increases in yield from fertilisers were not so marked as in other localities, in all probability due to a big percentage of it remaining undissolved in the soil. This would apply particularly to P7, which, containing bonedust, requires a plentiful supply of moisture to become completely available.

## Summary of Experiments.

A summarisation of the foregoing experiments discovers four outstanding features. There will be noted (1) the consistency of the yields of white-skinned varieties, not only on the elevated Dorrigo and Eastern Dorrigo plateaux where the season was favourable, but on the alluvial soils of the river flats, where extreme drought conditions prevailed; (2) the evident drought-resisting qualities of Carman No. 1; (3) the consistent productiveness of Factor, Up-to-Date and Langworthy; and (4) the strong evidence in favour of the use of artificial fertilisers and of P7 in particular. All the trials were conducted on comparatively fertile soils and where the benefit of manuring would not be expected to be very pronounced. The results, however, show very substantial increases in all cases. This may possibly be because the fertilisers supplied the necessary plant foods in a form more readily available than that in which they were already present. This would particularly apply when the supply of moisture was deficient and the demands of the plants were heavy owing to a short growing period.

The two main factors in successful potato production within control of the grower are—(1) good soil preparation and (2) good seed. Concerning the former, too much stress cannot be laid on the importance of ploughing the land some months before planting to permit of the storage of moisture and the improvement of its physical condition through the ameliorating effects of frosts and soil ventilation. Keeping the surface well mulched by use of the harrows after the soil has received its first ploughing is of primary importance in the conservation of soil moisture; this has, too, a controlling effect on weed growth. This operation is necessary after rain in any quantity, and particularly after heavy falls, which break down the crumb structure and cause the soil to set.

With the increasing prevalence of drought conditions on the coast better cultural methods will have to be adopted, and storage of soil water must play a more important part in crop production.

Too much attention cannot be given to the selection of seed. The North Coast farmer is, with the exception of the Dorrigo grower, dependent on

other districts for his seed, and finds it a very difficult matter to get it true to name, of decent size, and free from disease. Experiments to determine the most economical size of set have been conducted from time to time, and the most satisfactory results have been obtained from the medium-sized tuber cut into two and with at least two well developed "eyes." The tendency is to sow sets much too small for the production of vigorous plants, and to use very small whole tubers. This cannot be too strongly condemned as a general farm practice, and more particularly in those districts where the crop is sown for seed. It is possible that small tubers may include a small proportion of the best strains of a variety, but they are, for the most part, the worthless trash of an unselected variety developed through years of plant variation. The persistent use of small seed, year after year, can have but one result—the rapid deterioration of the variety thus perpetuated by the steady and certain process of elimination of all the superior strains of that variety. Tubers may be small because of overcrowding or through some unfavourable condition, but if they are from a high-yielding plant they will give satisfactory results. It is the use of the tuber that is small because of inherent inferiority that causes varieties to deteriorate, or, as it is generally termed, "run out." In those districts where seed saving is possible there should be a continuity of seed selection, aiming at gradual constant improvement of the varieties found by experiment to be most suitable for the locality.

## "Pot Boilers" on the Murrumbidgee Irrigation Areas.

Although certain crops may be termed "pot boilers," the tendency on the irrigation areas is to turn these crops into more permanent features—in other words, to make a regular crop of something that at first was intended only to give a return until the farm became productive.

Two chief lines offer themselves to settlers at the present time, viz., fruit-growing and dairying (including pigs). With either of these industries the yearly return is supplemented by an improvement in the capital value of the farm—in the case of fruit-growing the fruit furnishes the income and the trees the improving capital value, while in the case of dairying the milk corresponds to the first and the natural increase in the herd to the second. With other lines, such as hay-growing, tobacco, peas, Sudan grass, and so forth, the annual return is removed from the land, but nothing remains to foster the capital account. Doubtless, lucerne on the best soils would be a good paying proposition, provided the farmer could afford to hold his hay over a good season, but even there the land has to be worked up and resown after a few years. One hears of different farmers, chiefly orchardists, keeping things going during the period of development by growing different side lines, but if the side lines were made regular farm crops the production would soon be greater than the demand.—A. N. Shepherd, Assistant Inspector of Agriculture.

# Popular Descriptions of Grasses.

[Continued from page 512.]

E. BREAKWELL, B.A., B.Sc., Agrostologist.

## THE SPOROBOLUS GRASSES.

THE Sporobolus grasses are fairly common over the warm parts of both the Old and the New World.

Their economic importance varies considerably according to the species. The well-known American Sacaton grasses (for example, *S. airoides* and *S. Wrightii*) are considered very valuable grasses, particularly on alkaline lands, while other species receive such invidious names as Rush grass and Cord grass—fair indicators of their low value.

In New South Wales the Sporobolus grasses cannot be considered nearly as important as some of the genera previously described, but one species, *S. indicus*, is very common over the greater portion of the State, and is of least value of all. The Sporobolus grasses in the western districts, however, although limited in abundance, have a very high feeding value, and are very much unlike the *Sporobolus indicus* (Parramatta grass) of the coast.

*Habit.*—Sporobolus grasses vary considerably in superficial appearance. In the western districts the inflorescence resembles that of the Love grasses. Close examination, however, will show the presence of only one flower on each spikelet, while in the Love grasses there are several overlapping flowers to every spikelet.

The Sporobolus grasses on the coast, however, have the inflorescence in the shape of a long spike, and are often called Rat's Tail grass on this account.

*Sporobolus indicus* (Fig. 1), commonly known as Parramatta grass, Tussock grass, or Rat's Tail grass, is very common on the sandstone soils of the coastal districts as well as on the alluvial and volcanic soils of the interior. It is perhaps more common in the County of Cumberland than anywhere, and is a constant source of trouble in Sydney grass lawns. Being tussocky in appearance and rapid in growth in the summer, it becomes very unsightly in a lawn. It has been proved, however, that a good growth of other grasses on enriched soils will succeed in suppressing it, whereas the grass itself will stand a great deal of hard treatment on poor soils before it can be eradicated. Top-dressing of buffalo and couch lawns is essential if Parramatta grass has to be suppressed. Tufts of this grass should and can easily be removed when the soil is moist, by twisting the stems in the hand, grasping the grass low down, and pulling hard; the whole root system of the tuft is removed in the operation.

**Fig. 1.—On the left,** ***Sporobolus diander;*** **on the right,** ***Sporobolus indicus.***

Note that the inflorescence is more broken in *S. diander* than in the other. Both are typical coastal *Sporobolus* grasses.


**Fig. 2.**—On the left, *Sporobolus Lindleyi;* on the right, *Sporobolus actinocladus.* Note the attractive inflorescence of *S. Lindleyi.* Both are typical interior *Sporobolus* grasses.

The texture of the leaves and stems of Parramatta grass is particularly hard, and horses have been known to loosen their teeth in grazing on it, as the animals have to pull rather than break the stems and the leaves. Cattle and horses will eat the grass in its young stage, but its palatability and nutritious qualities are of a very low order.

*Sporobolus diander* (Fig. 1), although found in similar localities to *S. indicus*, is much softer and more palatable. It is fairly abundant around Newcastle and Maitland, on the northern rivers, and on the northern slopes and tablelands.

*Sporobolus virginicus* is a typical example of an alkaline grass, and is common in the salty marshes around Sydney and elsewhere. Something like the ordinary Parramatta grass in its inflorescence, it can readily be distinguished by its rigid wiry leaves. It is often grazed in its young stages, and although it contains a fair amount of fibre (29·41 per cent.), it is fairly high in protein (8·60 per cent.) and in carbohydrates (about 25 per cent.).

*Sporobolus Lindleyi* and *S. actinocladus* (Fig. 2) are the two best Sporobolus grasses in the interior. They are common on both the red and black soils, being particularly noticeable after summer thunderstorms. They are very succulent grasses with wide tender leaves. Their period of growth is very short and they quickly break into flower. For decorative purposes a bunch of flowers from *Sporobolus Lindleyi* would be hard to excel. The flower branches become very easily broken off, however, before the seed matures, and if a permanent stand is sought it is absolutely necessary that the grass be protected until the seed is ripe. This treatment is quite practicable, as the flag does not appear to be affected after the ripening period.

## The Searing Iron versus the Knife for Detailing Lambs.

Experiments have been conducted by the Texas Agricultural Experiment Station, U.S.A., to determine whether the searing iron is better than the knife for detailing lambs. The results, which are presented in Bulletin No. 262 of the station, directly agree with results of similar trials conducted in New South Wales some years ago. They are summarised as follows:—

The results obtained in docking 200 lambs indicated that no advantage is to be gained in docking young lambs with the hot iron or docking pincers. This operation can be performed more quickly with the knife, and apparently with no great danger of fatalities due to excessive bleeding.

The lambs docked with the sharp knife healed one week sooner than those docked with the hot iron.

In practically every instance the knife left a healthier, cleaner wound or sore than did the hot iron.

The lambs docked with the knife made a slightly larger gain throughout the test than did those docked with the hot iron.

No advantage was gained by searing the artery after docking with the knife.

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**The Director and Scientific Staff of the Cawthron Institute, Nelson, N.Z.**

W. C. Davies, Curator.

R. J. Tillyard, M.A., D.Sc., F.L.S., Biologist. A. Philpott, Assistant Entomologist.

Professor T. H. Easterfield, M.A., Ph.D., F.I.C., Director.

Maxwell Young, F.C.S., Assistant Chemist. T. Rigg, M.A., M.Sc., Agricultura Chemist.

Miss Kathleen M. Curtis, M.A., D.Sc., D.I.C., Mycologist.


**The Temporary Quarters of the Cawthron Institute, Nelson, N.Z.** Inset, a photograph of the late Mr. T. Cawthron.

The town of Nelson has grown some since this photograph was taken.

# The Cawthron Institute of Scientific Research, Nelson, New Zealand.

WHAT wealth, directed by appreciation of the value of science, may do for industry generally and for any community in particular is indicated in some degree by an institute that has lately been founded in New Zealand, and that might well suggest to some citizen of New South Wales a direction in which he could serve his country.

The Cawthron Institute of Scientific Research, located in the town of Nelson in New Zealand, has come into existence by reason of the foresight and generosity of Mr. Thomas Cawthron, a well-known citizen of Nelson, who died in 1916, leaving the residue of his estate, after the payment of certain legacies, for the purchase of land and the erection and maintenance of a technical institute and museum.

The trustees under the bequest (the Bishop of Nelson, the Mayor of Nelson, the member of the House of Representatives for Nelson, the Chairman of the Nelson Harbour Board, and Mr. William Rout, the younger), deferred action during the war, allowing the interest on the principal to accrue, so that the capital available now approximates £200,000. A private commission appointed by the trustees to advise on the subject considered that the testator's wishes would be most suitably given effect to by establishing in or near Nelson, an institute, which should include a museum illustrative of the industries of the Nelson provincial district, but which should chiefly give instruction in and perform scientific research in subjects definitely related to the industries of the Dominion, paying special attention at the outset to agriculture and particularly to fruit-growing, but, as funds permitted, taking up systematic research in the chemistry, physics and biology of the soil, the development of forest lands, afforestation, utilisation of minerals, the fishing industry, and such other subjects as might be deemed important from time to time. The commission in concluding its report, emphasised the educational value of the institution it thus suggested, and considered that the value of research as a factor in education had been quite insufficiently recognised in New Zealand, and, indeed, throughout the British Empire.

Proceeding upon these lines, though with some necessary variations in detail, the trustees at the close of the war, appointed an advisory board of seven members, a director, and a staff consisting of scientific officers and their assistants. The Director, Professor T. H. Easterfield, brings to his task ripe experience, business ability, and tact. He has paid much attention to the chemistry of the native flora of New Zealand, and is as well known to the manufacturers as to the scientific men of the Dominion. Mr. Rigg, the Agricultural Chemist, has carried out chemical research work in the

Cambridge School of Agriculture and at the Rothamsted Experiment Station in England. Dr. Tillyard, well known in connection with entomological research in New South Wales, will study insect pests with a view to keeping them under control, and Dr. Kathleen Curtis has ample work before her in connection with the fungus diseases affecting fruit and other crops in the Dominion.

The work of the Institute will, in the first instance, be carried out in a fine residence which has been secured for the purpose and fitted up with laboratories, a library and a museum, while the grounds will afford room for glass-house and plot experiments. For the permanent location of the Institute, a magnificent site, three or four miles from the town, has been secured.

The Cawthron Institute has been launched under very favourable circumstances, and it should play an important part in the development of science and industry in this quarter of the world, but many great and significant opportunities await any who may emulate the late Mr. Cawthron's excellent example.

## Fallow or Summer Fallow?

The value of a full fallow as against a short or summer fallow was illustrated at Trangie Experiment Farm last season. Certain red soil fallowed in August, 1918, and sown with Federation in 1919 yielded 6 bushels per acre, while Sunset wheat sown on similar land that had only been summer fallowed was a total failure. It appears that the difference between a total failure and a 6-bushel crop was due to the difference of a few months in fallowing, yet only 3·22 inches fell between the 1st August and 31st December, 1918—in other words, the long fallow only had the opportunity of conserving 3¼ inches more than the summer fallow—truly the facts in favour of sound methods do multiply.—A. H. MacDougall, Manager, Trangie Experiment Farm.

## A Woman's Movement in Rural Life.

Canada is the birthplace of Women's Institutes. Twenty-two years ago a little group of countrywomen in Ontario met to discuss the question of lightening the loneliness of their lot on remote farmsteads. They met at each other's houses at fixed intervals, not only for social entertainment but also for devising means to secure the various improvements their homes and the district required. Thus the Women's Institute came into being.

Very soon the homes and the farms showed what changes could be accomplished through the efforts of an organised band of intelligent women. The example inspired other women, and before long the institute movement had spread through Canada, and thence into the United States. In 1915 it reached Great Britain, by way of Wales, where . . . started the first Women's Institute in Great Britain. . . . The number has now risen to over 1,600, and will certainly increase, for these centres of industry and recreation are imparting to village life much of the stimulus needed.—*Journal of the Ministry of Agriculture*, London.

# Farmers' Experiment Plots.

## Maize Experiments, 1919–20.

### South Coast District.

R. N. MAKIN, Inspector of Agriculture.

THE crops from the past season's maize experiments were the best harvested for many years on the South Coast. Weather conditions were favourable for heavy yields, owing to bountiful rain falling during December and January, when the crops were cobbing—the critical time with maize. The experiments comprised variety trials and tests to determine the most suitable class of artificial manure for grain and green fodder.

The following farmers co-operated with the Department in carrying out the work :—

J. H. Martin, Pambula.
J. Chittick, Kangaroo Valley.
E. G. Kelly, Bega.
L. B. Garrad, Milton.
Geo. Lindsay, Dapto.
Superintendent, Boys' Farm Homes, Mittagong.
J. Timbs, Albion Park.
V. J. Collins, Bemboka.
J. Hansen, Moruya.

At Moruya the returns were, for some unaccountable reason, so variable, that it was decided not to record them.

#### The Varieties Reviewed.

The variety trials were productive of much interesting information. The season favoured the later maturing varieties, and some heavy yields were obtained. At Pambula a new variety, Kansas Sunflower, yielded 113·8 bushels, topping all other varieties, but it was much the latest in point of maturity. On the same plots another new variety, U.S. 133, yielded 80 bushels per acre within 130 days of planting, and attracted a great deal of attention from local farmers on account of its early maturity. Boone County White came well to the fore as a great yielding variety under suitable conditions. It is a fairly hard maize, and yields a fine sample of grain ; the cobs generally set well, and are very uniform, and it is a variety that is fast coming into favour with those who grow white corn. Leaming, Silvermine, and Eureka are varieties that suit the South Coast well. Leaming is a variety very suitable for poultry-farmers, and is also one that will be found to crack well where it is necessary to crack corn.

Golden Glow, a variety about as early as U.S. 133, is a promising sort. This and Sibley (a variety largely grown in Victoria) were tested at Pambula

alongside the Department's varieties, as was also Reid's Yellow Dent, seed of which was imported by Mr. J. A. Martin from the United States. The varieties here mentioned stood out above all others as grain varieties.

### Details of the Plots.

*Pambula.*—Sown 20th October, 1919; harvested 26th June, 1920. Soil, alluvial deposit from granite and basalt. Ground prepared early and ploughed and harrowed again before sowing; previous crop corn. Sown by hand on the check, three grains every 3 feet 6 inches. Effective rainfall, 20·73 inches. Plot flooded in December and January. Light frost 21st November. Manured with P7 mixture at the rate of 2 cwt. per acre.

*Kangaroo Valley.*—Sown 28th October, 1919; harvested June. Soil, sandstone. Prepared early and ploughed again and harrowed prior to sowing. Sown with corn-planter, drills 4 feet apart, 3 grains dropped every 2 feet 6 inches. Rainfall, 23·06 inches. Manured with P7 mixture at the rate of 2 cwt. per acre.

*Bega.*—Sown 16th October, 1919; harvested 10th June, 1920. Soil, alluvial deposit from granite. Plot prepared early and again worked prior to sowing. Drills run with plough; seed and manure hand-sown. Rainfall, 26·55 inches. This test included trials of both complete and incomplete artificial manures. Unfortunately a soakage from a swamp adjacent to the plots affected those treated with mixtures P5, P7, and P8.

*Milton.*—Sown 4th October, 1919; harvested July, 1920. Soil, sandstone, situated on hillside; ground very variable. Plot prepared early and worked again before sowing. Seed sown with corn-planter, drills 4 feet apart, single grain in drill every 10 inches. Rainfall, 22·50 inches.

*Albion Park.*—Sown 20th October, 1919; harvested May, 1920. Soil, sandstone. Plot prepared early and worked again before planting. Seed and manure sown with corn-planter. Drills 4 feet apart, 3 grains every 2 feet 6 inches. Rainfall, 23 inches. Weed growth troublesome.

*Mittagong.*—Sown 23rd October, 1919; harvested 9th March, 1920. Soil, sandstone formation. Plot prepared early and worked again before planting. Seed (30 lb. per acre) sown with maize-planter in drills 3 feet apart. Rainfall, 22·79 inches. Crop considered one of the best ever raised in the district.

*Bemboka.*—Sown 11th December, 1919; harvested May, 1920. Soil, granite formation. Ground prepared early and ploughed again before planting. This plot was sown too late for good returns and unfortunately the rainfall was insufficient.

*Dapto.*—Sown 19th November, 1919; harvested 22nd March, 1920. Soil, from sandstone. Seed (30 lb. per acre) sown in drills 3 feet apart. This plot also was sown too late and weed growth was very troublesome, the ground being unworkable during December and January owing to heavy rain.

RESULTS of Maize Variety Trials.

| Variety. | J. Chittick, Kangaroo Valley. | J. H. Martin, Pambula. |
|---|---|---|
| | bushels per acre. | bushels per acre. |
| Yellow Hogan ... ... | 48 | ...... |
| Leaming ... ... ... | 66·48 | 103·40 |
| Star Leaming... ... ... | 50·32 | ...... |
| Red Hogan ... ... ... | 47·24 | 101 |
| Narrow Red Hogan ... ... | 56 | 94·15 |
| Golden Beauty ... ... | 60·32 | ...... |
| Improved Yellow Dent ... | 66·36 | 95·25 |
| Boone County ... ... | 71·22 | 108·24 |
| Hickory King... .. ... | 59·24 | 84·49 |
| Craig Mitchell ... ... | 49·24 | ...... |
| Silvermine ... ... ... | 40·16 | 104·40 |
| Leggett's Pride ... ... | 45·24 | 103·40 |
| Funk's Yellow Dent... .. | ...... | 96·12 |
| U.S. 133 ... ... ... | ...... | 80·8 |
| Kansas Sunflower ... ... | ...... | 113·8 |
| Eureka... ... ... ... | ...... | 104·19 |
| Golden Glow ... ... ... | ...... | 81 |
| Sibley ... ... ... ... | ...... | 108·24 |
| Reid's Yellow Dent ... ... | ...... | 105·48 |

RESULTS of Manurial Trials for Green Fodder (Variety, Improved Yellow Dent).

| Manures and Mixtures. | Farm Homes, Mittagong. | | | | V. J. Collins, Bemboka. | | | | Geo. Lindsay, Dapto. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. | t. | c. | q. | lb. |
| Manure, M5* ... ... ... | 27 | 4 | 1 | 4 | 8 | 5 | 0 | 0 | 10 | 0 | 0 | 0 |
| 2 cwt. P7* ... ... ... ... | 30 | 12 | 3 | 12 | 8 | 5 | 0 | 0 | 9 | 16 | 0 | 0 |
| 2 cwt. P8* ... .. ... ... | 28 | 11 | 1 | 20 | 8 | 10 | 0 | 0 | 11 | 2 | 3 | 12 |
| 2 cwt. blood and bone ... ... | 26 | 15 | 2 | 24 | 9 | 5 | 0 | 0 | 14 | 11 | 1 | 20 |
| No manure ... ... ... ... | 12 | 2 | 0 | 16 | 7 | 0 | 0 | 0 | 14 | 1 | 2 | 24 |
| 2 cwt. basic superphosphate ... | 20 | 11 | 1 | 20 | 8 | 10 | 0 | 0 | 14 | 11 | 1 | 20 |
| 2 cwt. superphosphate ... ... | 27 | 16 | 0 | 8 | 9 | 0 | 0 | 0 | 14 | 6 | 0 | 8 |
| 1 cwt. superphosphate ... ... | 22 | 4 | 1 | 4 | 9 | 0 | 0 | 0 | 9 | 5 | 2 | 24 |

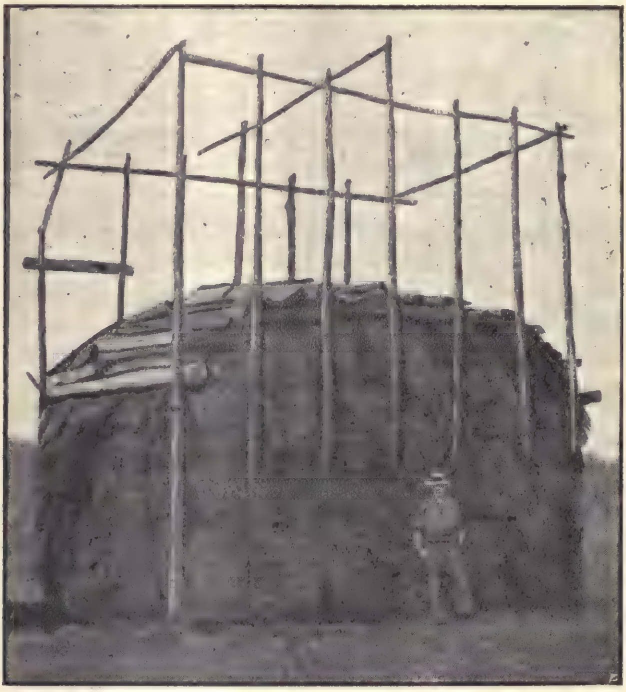
* The Mixture M5 consists of superphosphate 2 parts and sulphate of ammonia 1 part ; P5, of superphosphate 4 parts, sulphate of potash 1 part ; P7, of superphosphate and bone-dust, equal parts ; and P8, of superphosphate and blood and bone, equal parts.

RESULTS of Manurial Trials for Grain.

| Manures and Mixtures. | L. B. Garrad, Milton. | E. G. Kelly, Bega. | J. Timbs, Albion Park. |
|---|---|---|---|
| | bushels per acre. | bushels per acre. | bushels per acre. |
| 2 cwt. blood and bone ... | 91·24 | 104·24 | 27·14 |
| 2 cwt. basic superphosphate ... | 99·24 | 101·40 | 27·40 |
| 2 cwt. P8 ... ... ... | 107·24 | 86·32 | 33·24 |
| 2 cwt. P7 ... ... ... | 101·10 | 79·40 | 32·16 |
| 1½ cwt. P5 ... ... ... | 113·8 | 77·0 | 31·24 |
| No manure ... ... ... | 109·40 | 93·16 | 23·8 |
| 2 cwt. superphosphate ... | 105·8 | 113·38 | 25·40 |
| 1 cwt. superphosphate ... | 98·26 | 108 | 25·24 |

## A Silage Stack on the North Coast.

The accompanying illustration of a silage stack constructed on the lines suggested in the *Agricultural Gazette* for November, 1919, affords evidence of the usefulness of the method. The photograph was forwarded by Mr. L. I. Uther, of Bonville, an old diploma student of Hawkesbury Agricultural College, who stated that this stack was built by a neighbour, Mr. F. Williams, according to the directions given in the *Gazette*. Previously Mr. Williams had built silage stacks in the old way (crossing the maize at the corners), and had had considerable waste. The stack photographed turned out the best Mr. Uther had ever seen, the waste on the sides not being more than 6 inches and on the ends about 9 inches. The maize was right up to the



**A Silage Stack at Bonville.**

top when stacking was finished, and the photograph was taken when settling was completed. The following details were also supplied: Crop, 7 acres of Yellow Dent maize; base of stack, 14 feet x 16 feet; labour involved, four men for 6½ days, with two horses and drays, and a horse to lift the stuff; slings were used to split the loads into four and were hoisted direct from the drays; estimated tonnage, 70 tons; estimated cost, 4s. 6d. per ton for cutting and stacking.

In sending the above, Mr. Uther mentioned that a tenant of his had also made a stack on these lines and that it had also turned out well, though the percentage of waste was higher owing to insufficient weighting.

# Trials of Grasses and Fodder Plants.

## Glen Innes Experiment Farm.

L. F. ROWNEY, H.D.A., Experimentalist.

INSTRUCTIVE results were obtained with a number of grasses, clovers and lucernes at this farm during last season, and reference to the behaviour of some of them may be of interest to farmers. The plots are about ·21 chains wide and about 1·19 chains long, equalling, therefore, about one-fortieth of an acre. The rows are ·04 chains apart and run about five per plot, and the divisions between plots are ·05 chains wide. In computing the results allowance has been made for misses or blanks in the rows, but the yields under field conditions would actually be heavier.

### Grasses.

*Andropogon intermedius* (Prairie Blue Grass).—This tufted perennial has been under observation in the grass garden for several years. It is one of the best of our native grasses, but in this district it dies down completely during severe winter weather. Under good conditions it grows over 3 feet in height, and can be cut two or three times in a season. It reaches its maximum growth in late summer, and is palatable at all stages of growth. One objection is the poor germinating quality of its seed, but it is noticed that under cultivation the vitality of the seed is appreciably increased.

*Andropogon affinis* (Blue Grass).—This grass makes little or no progress during the winter, but very fair spring and summer growth, reaching its maximum about mid-summer, reaching 3 feet 6 inches in height under good conditions. It is spreading through the grazing areas of this farm, and doing much to improve their quality and carrying capacity. The degree of palatability can be gauged from the fact that it is only in sheltered positions and the headlands of cultivation paddocks that it gets any chance of setting seed. Were it not for the fact that the seed produced is of low vitality, *Andropogon affinis* would form one of the principal constituents of the native pastures of this farm.

*Bromus japonicus*.—This appears to be a perennial form of Prairie grass. It withstands frost well, and makes very good growth during late winter and early spring. Two or three cuts may be made during a season, and the grass makes excellent growth after cutting. It is palatable, with light green, fairly sweet leaves, producing a fair bulk of fodder. It grows readily from seed, which it produces in fairly large quantities.

*Festuca arundinacea* (Giant Fescue).—This is an introduced perennial which has had a good trial at this farm. It is an excellent frost resister and grows well during a dry spell. Its leaves are dark green, broad, and fairly

soft. It produces a good yield of fodder, which may be cut two or three times in a season. It is more suited for grazing with cattle than with sheep. The seed germinates fairly readily and may be procured from various seedsmen. A great defect is that in wet seasons it is liable to ergot; but clean strains of seed are procurable.

*Schedonorus Hookerianus* (Hooker's Fescue).—This is very similar to Giant Fescue, but of native origin, and the seed is not procurable in any quantity. The grass produces a greater abundance of leaves than Giant Fescue, but it is also liable to ergot.

*Danthonia semiannularis* (Wallaby Grass).—This is probably the best of the native grasses suited to this district. It is a small tufted perennial, making excellent early spring growth, growing quickly after cutting, and being at its best about mid-summer. It withstands frost well, and in all stages of growth is relished by stock.

It forms a large proportion of the pastures of this farm and district, but can only be distinguished by laymen where it has had protection from stock. Under these conditions it flowers freely, producing a sufficiency of seed to largely counteract its poor germinating powers.

*Dactylis glomerata* (Cocksfoot).—This is an introduced perennial of tussocky habit. It withstands dry weather fairly well, and frosts to a large extent, remaining green throughout the winter. It makes a fairly good start in early spring, attaining its best growth in early autumn. It is palatable and stands stocking well. After a few years, if understocked in good seasons, it has a tendency to become rather harsh and tussocky, and is probably more suited for sowing in a mixture than alone. It makes very fair headway after cutting. Seed of this grass is easily procurable commercially, and to obtain a good stand in the field is no problem to any farmer.

*Waipu* (from New Zealand).—A prostrate perennial, this grass spreads rapidly by means of underground stems. It produces a fair quantity of soft, light green leaves, attaining its maximum growth in autumn. It withstands frost very well, but makes little progress during the winter. A minimum quantity of seed is formed, which is of doubtful germinating quality.

*Phalaris bulbosa* (Toowoomba Canary Grass).—An introduced perennial, which has had continuous trial at this farm, under both plot and field conditions. It withstands frost very well, and even during severe winter weather it makes fair headway. Its growth during a dry spell is very marked in comparison with other grasses. In a normal season it grows 3 feet to 4 feet in height, being at its best toward the end of the summer. Patches under the best of conditions on this farm have reached a height of 7 feet without becoming harsh or woody, the leaves reaching to more than half this height. It is palatable, stands stocking well, but under some conditions it has a tendency to run out after a few years, producing leaves only on the outer edge of the tufts. Best results would be obtained by grazing this grass with both cattle and sheep.

*Lolium perenne* (Perennial Rye Grass).—This grass seldom grows more than 2 feet in height, forming comparatively small tufts. It produces an abundance of dark green, soft, palatable narrow leaves. Its great features are its frost resistance and its abundant early spring growth. This places it in the front rank of the introduced grasses suitable for this district, where the lack of late winter and early spring pasturage is so acutely felt.

Under field conditions, with normal rainfall and stocking, it commences to run out after about four years. It withstands dry weather fairly well, but on light ground a continued dry spell is liable to kill it out. Very little difficulty is experienced in getting an excellent stand of this grass from seed

*Deyeuxia coarctata.*—The growth is spreading, the seed-heads not being above 1 foot in height. It produces a quantity of dark green leaves, which are fairly soft and palatable. It withstands frost rather well, and is not badly checked by dry weather. The seed is very small and light and germinates only fairly well. This introduced perennial has had only limited trial here, but it is worthy of consideration, for it has all the characteristics of a grass that will stand feeding off and trampling by stock.

*Avena elatior* (Tall Oat Grass).—This introduced perennial, growing in tufts, produces an abundance of dark green, soft, palatable leaves. It withstands frost to a very marked degree, and appears to be but little checked by dry weather. It has had a good trial at this farm, and is undoubtedly one of the most promising grasses for this district. We have no data available here regarding its behaviour under stocking. It is to be hoped that this difficulty will shortly be overcome, for the grass has attracted the attention of many by its excellent appearance in the trial plots. It is very sweet and palatable, and makes rapid growth after cutting. Seed may be obtained commercially, and no difficulty should be experienced in obtaining good results from this grass.

*Phleum pratense* (Timothy).—This perennial has not maintained here the reputation it has in America. It produces only a medium quantity of fodder, and appears to require frequent re-sowing. It is palatable, but makes but little growth during winter and under a dry spell.

## Lucernes.

Tamworth Lucerne.—This has proved its suitability to the district in continuous trials at this farm. The habit is erect, with broad leaves. It is more suitable for cutting than grazing, and makes rapid growth after each cutting. It stands frost and dry weather well.

Montana.—While not growing as tall as Tamworth, this variety produces a greater bulk of fodder at each cut. The leaves are smaller and of a darker green, and its stooling habit is more marked than that of Tamworth.

Kansas and Northern Californian.—Both are similar in appearance and habit of growth to Montana. All three varieties withstand frost and dry weather well.

Algerian.—This variety has had extended trial at this farm, and its suitability to the district is unquestioned. The seed, however, is unprocurable, the original package having been imported from Africa.

Grimm.—This lucerne has had but limited trial here. It was, however, originally grown in a cold climate. The habit of growth is rather prostrate, with fairly small dark green leaves, appearing to be more suited for grazing than cutting.

Bathurst No. 6.—Originating at Bathurst Experiment Farm, this variety is fairly prostrate in habit, with medium-sized dark green leaves. It resists frosts very well, and appears to be a promising strain for the district.

Chubut.—This variety is rather prostrate in habit of growth, and resists frosts well.

Dakota.—Of rather erect habit, Dakota makes quick growth after cutting. Like Chubut, it has had only a limited trial.

Peruvian.—The growth is erect, and the leaves fairly large and hairy. It is a poor stooler, and only fairly palatable. It has very little to recommend it for this district.

Extended work with lucerne cannot be carried out at this farm on account of the fact that lucerne does not set seed here. A total area of about 16 acres has been laid down under Montana lucerne, that variety having given the most satisfactory results. The seed, however, had to be procured from America. Those desirous of putting down an area under lucerne in this district need not hesitate about using Tamworth, the seed being easily procurable.

## Clovers and Sheep's Burnett.

*Melilotus alba* (Bokhara Clover).—This biennial has now had good trial at this farm, and has without doubt proved its suitability to the district. It has passed the experimental stage, and field areas have been laid down on the farm. Farmers in this district who have given this excellent forage plant a trial have in all cases enlarged their areas under it, for it may be grazed by both cattle and sheep. It does not make much growth in winter in the coldest portions of the district, but provides excellent grazing until late in the autumn. During the second year it sets seed freely, and no difficulty is experienced in maintaining a stand. Best results are obtained by sowing in the spring.

Ladino.—This clover is likely to prove one of the most important introductions we have made from America for some time. It is a prostrate perennial with white flowers. The stems root freely at the nodes, and each plant soon occupies a large area, reaching 2 feet from the centre in any direction. The leaves are dark green in colour, and although rather small are produced in fair quantity. It grows fairly well in the winter, and in spite of the dry conditions existing here for the past two years, it has made very fair progress.

*Trifolium pratense perenne* (Perennial Red Clover).—This is a strong shooting perennial, producing a large amount of dark green, broad, succulent leaves. It grows well in winter and stands dry weather fairly well. The root system is deep, the tap root being about 10 inches long. The flowers are large and of heliotrope colour. It has been used in rotation systems at

the farm for over ten years, and has given satisfactory results. In good seasons it grows to 2 feet 6 inches in height, and can be cut for hay. The bulk of the seed used in the State comes from New Zealand.

*Trifolium pra'ense perenne* (Chilian Clover).—This is a strain of perennial red clover which is superior to the better known one, being a better drought resister and setting seed more freely. Under some conditions it gives a heavier yield of fodder per acre.

*Poterium sanguisorba* (Sheep's Burnett).—This valuable fodder plant has been grown at the farm for some years past. Records from year to year show that it grows strongly winter and summer whether the season be wet or dry. It has been grown successfully in the coldest positions on the Southern Tableland, as well as in the west of this State.

## Tick Eradication in United States of America.

The first steps for the eradication of the tick from the southern portion of United States were taken in 1905, and so well organised and successful has the work been that it is now claimed that the end is almost in sight. Some idea of the immensity of the work is conveyed by Veterinarian E. I. Smith in a recent number of the *Journal of the American Veterinary Medical Association.* In 1905 the whole of six States, and large portions of six others, were quarantined on account of the danger of taking the cattle tick, and tick fever, further north. The first work to be done was educational, attempts being made to explain what the economic results of the removal of the cattle tick would be, and at the same time all information about the cattle tick was collected. Slowly the methods employed to fight the tick, such as pasture rotation, spraying and dipping, were brought into action, and as the northern portion of the area was cleared and released from quarantine, the people in the cleared area demanded protection from the infected country further south, and began to insist on eradication in those areas also. After the arsenical dip came into use, the work was carried out much more effectively and quickly, until by December, 1918, 63 per cent. of the territory originally quarantined had been released, and Smith asserts that from present indications, within five years the tick will be a matter of history in the United States.

A few figures will indicate how big was the undertaking: 35,000 dips were in operation, which used in one year over 900,000 lb. of arsenic; nearly 3,000 men were directly employed by the Government in the work, and the number of dippings in 1919 ran to over 48,000,000. Inquiries made from the authorities of the various States showed that the value of the cattle had increased as a result of tick eradication from 20 to 100 per cent., and correlated with it there had been an increase in land values of 25 to 100 per cent.

The work is a standing monument to the capacity of the veterinary staffs of the State and Federal Departments, and is an object lesson to other tick-infested countries as to what may be done by energy and co-operation. Australia is faced with much the same problem, and the time will come when it will be tackled with the same courage and determination as was shown by the Americans. New South Wales may well desire to be the leader in such a movement.—Max Henry, M.R.C.V.S., B.V.Sc.

## Pure-seed Growers Recommended by the Department.

The following list of growers of pure seed of different varieties of farm crops is compiled to indicate to farmers where pure seed is at present available. The list is compiled on recommendations made after an inspection by a field officer of the Department.

| | |
|---|---|
| ***Maize*** :— | |
| Silver King (ungraded) | A. Sommerlad, Hillcrest, Tenterfield. |
| Early Yellow Dent | Manager, Experiment Farm, Glen Innes.<br>J. S. R. Crawford, Emu Swamp, Orange. |
| Silvermine | Manager, Experiment Farm, Yanco. |
| Small Red Hogan | H. Short, Dorrigo. |
| Craig Mitchell (ungraded) | W. D. K. Humphries, Muswellbrook. |
| Boone County White | J. Chittick, Kangaroo Valley. |
| Golden Beauty | R. Richardson, Mondrook, Tinonee. |
| Leaming | Manager, Experiment Farm, Grafton. |
| Golden Nugget | J. W. Smith, Wauchope. |
| Early Clarence | F. T. Dowling, Tumut. |
| Giant or Manning White | A. McM. Singleton, Henley, Sydney. |
| Improved Yellow Dent | Manager, Experiment Farm, Grafton. |
| Red Hogan | Principal, Hawkesbury A. College, Richmond. |
| ***Grain Sorghums*** :— | |
| Feterita | W. W. Hosking, Farm 778, Leeton. |
| *Sweet or Saccharine Sorghums* :— | |
| Saccaline | Manager, Experiment Farm, Lismore.<br>Principal, Hawkesbury Agricultural College, Richmond. |
| *Grasses* :— | |
| Paspalum | Manager, Experiment Farm, Lismore. |
| ,, | Manager, Experiment Farm, Berry. |
| Sudan Grass | W. W. Hosking, Farm 778, Leeton. |
| *Elephant Grass* (roots) | Principal, Hawkesbury A. College, Richmond<br>Manager, Experiment Farm, Grafton.<br>Manager, Experiment Farm, Lismore.<br>Manager, Experiment Farm, Yanco. |
| *Kikuyu Grass* (roots) | Principal, Hawkesbury A. College, Richmond. |
| *Clovers* :— | |
| Shearman's Clover (roots) | J. H. Shearman, Fullerton Cove, Stockton, *via* Newcastle. |
| Bokhara or Sweet Clover | A. Sommerlad, Hillcrest, Tenterfield. |

Growers of pure seed of any variety of farm crop who wish to be included in this list should communicate with the Under Secretary, Department of Agriculture, Sydney.

It is especially desired to locate reliable sources of seed of Thew, Huguenot, Firbank, and Florence wheats, Sunrise, Ruakura, and Guyra oats, and Cape and Skinless barleys, the demand for seed of which for coastal green fodder far exceeds the visible supply.

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When a farmer orders a box of bolts of a certain make and size he does not expect to find a thin layer of the bolts specified on the top of the box and assorted bolts underneath. In the world of commerce a manufacturer who pursued such practices would soon be bankrupt. The same principle applies to the sale of farm products. Before sending produce to market the farmer should sort it as to quality and size. It is estimated that in 1919 the potato growers in Virginia increased their profits a half million dollars by grading their produce.—U.S. *Weekly News Letter*.

# Farmers' Experiment Plots.

SUMMER FODDER EXPERIMENTS, 1919-20.

## Central Coast.

J. M. PITT, Assistant Inspector of Agriculture.

EXPERIMENTS with summer fodder crops were conducted by the Department during the season 1919 in conjunction with the following farmers :—

J. C. Duff, Somerset, Mt. George, Manning River.
A. H. Norris, Mt. George, Manning River.
R. Richardson, Mondrook, Manning River.
A. C. McLeod, Mondrook, Manning River.
V. Murray, "Pigeon Grove," Pampoolah, Manning River.
J. P. Mooney, Dumaresque Island, Manning River.
C. J. Ellis, Tinonee, Manning River.
J. Davis, Sherwood, Macleay River.
R. Lindsay, Belmore River, Macleay River.
A. O'Shea, Belmore River, Macleay River.
J. Smith, "Hazeldean," Wauchope, Hastings River.
O. Collins, East Comboyne.
W. H. Duffy, East Comboyne.
Alex. Smith and Atkins Bros., Bandon Grove, Dungog, Williams River.
M. Smith, "Bona Vista," Paterson River.

Excepting those on the Comboyne and at Paterson, the trials were conducted on rich alluvial flats; the Comboyne trials took place on volcanic soil, and those at Paterson on ordinary hillside soil, both being typical of the surrounding country.

### Sowings.

Preparatory cultural operations were satisfactory, farmers having ample time to prepare clean seed beds while waiting for the drought to break. Sowings were mostly made with the hand on the smaller plots, and by the maize dropper, fitted with a suitable sorghum or millet plate, on the larger areas. Shallow drills were struck out 3 feet apart, this distance allowing of cultivation for the destruction of young weed growth and the maintaining of a surface mulch. Neither of these objects, however, was attained, owing to continuous rain rendering after-cultivation operations impracticable, and weeds and summer grass grew apace. The extreme moist conditions were also conducive to attacks of blight in the Sudan plots, this fact being more noticeable during the late summer and autumn months. Where the crop was sown on the highland at Paterson, however, and grazed off, the disease was negligible.

Mr. Murray's plot at Pampoolah was a failure, the dry conditions under which the seed was sown preventing germination; 5 lb. of Sudan seed and 6 lb. of Saccaline were sown per acre. At Tinonee, where 5 lb. Sudan seed was sown per acre, the yield was not weighed, but cows relied on the crop for several weeks. The crops on Mr. O. Collins' plot at East Comboyne were smothered by summer grass.

The details of the rate of seed per acre and method of sowing on the plots mentioned in the accompanying table of yields was as follows :—J. C. Duff, Mount George—Sudan (drills) 5 lb., Saccaline 7 lb., Planter's Friend 7 lb., Japanese millet 4 lb. ; A. H. Norris, Mount George—Saccaline (drills) 8 lb. ; R. Richardson, Mondrook—Sudan (drills 2 feet apart) 5 lb., (drills 1 ft. 6 in. apart) 10 lb., Saccaline 6 lb., Planter's Friend 7 lb.; A. C. McLeod, Tinonee—Sudan 5 lb., Saccaline 8 lb., Planter's Friend 6 lb., Japanese millet (drills) 4 lb. ; J. P. Mooney, Dumaresque Island—Sudan 6 lb., Saccaline 6 lb., Planter's Friend 7 lb. ; J. W. Smith, Wauchope—Saccaline 8 lb. ; M. Smith, Paterson River—Sudan 5 lb. ; Alexander Smith

**Saccaline on Mr. J. C. Duff's Farm, Mount George, Manning River.**

The crop averaged 13 feet 6 inches high and weighed 29 tons to the acre.

and Atkins Bros., Bandon Grove—Sudan 5 lb. (one sowing fertilised with superphosphate at 1 cwt. per acre), Saccaline (one sowing with 1 cwt. superphosphate) 7 lb. ; R. Lindsay, Belmore River—Saccaline 8 lb. ; J. Davis, Sherwood—Sudan 6 lb., Saccaline 8 lb. ; W. H. Duffy, Comboyne—Japanese millet, in drills 4 lb., broadcasted 12 lb., Saccaline 6 lb.

### Harvesting.

Most of the crops were cut either by scythe or mower, carted off, and fed. This method is preferable with Saccaline and Planter's Friend ; Sudan and Japanese millet are better grazed where possible. Several progressive farmers reserved portions of their crops for seed—a wise policy in view of so much other fodder being available.

### Yields.

The yields in many instances—chiefly where the better cultural methods were adopted, or on newly-broken land—were records. Farmers in general speak in glowing terms of both Sudan and Saccaline, regarding the latter as "something out of the bag."

The increase in the number of experimenters may be regarded as an indication that dairymen are at last realizing the importance of providing some other fodder than that provided by natural pastures. The central coastal districts, by reason of their fertile soils, long growing season, and the high rainfall (at least during some portion of the year) should, if farmers would avail themselves of the opportunities offered by these conditions, be practically immune from drought. Yet we find the majority of dairymen most negligent in this respect—firstly, in regard to the growing of sufficient fodder to maintain their herds, especially during the winter and early spring, when most of the stock are very low in condition through want of fodder; and secondly, in neglecting to store even the smallest portion of the tons and tons of fodder that go to waste annually on each farm.

TABLE showing yields at each centre.

| Grower. | Date of Sowing. | Sudan Grass. | | | Saccaline. | Planter's Friend. | Japanese Millet. |
|---|---|---|---|---|---|---|---|
| | | First Cutting. | Second Cutting. | Total Yield. | | | |
| | | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. |
| J. C. Duff, Mount George | 21 Oct. | 7 | 11 | 22* | 29 (13 ft. high) | 25½ | 6 |
| A. H. Norris, Mount George. | 11 Oct. (First). 10 Nov. (Second). | ........ | .... | .... | 18 (1st sowing) 20 (2nd sowing) | ...... | .... |
| R. Richardson, Mondrook | 7 Nov. | 8⅜ (3 ft. apart) 14¼ (1 ft. 6 in. apart) | .... | .... | 28½ | 20 | .... |
| A C. McLeod, Tinonee .. | 12 Nov. | 6½ | 6¼ | 12¾ | 22¼ | 20⅛ | 7¼ |
| J. P. Mooney, Dumaresque Island. | 8 Nov. | 9¼ | Not weighed. | 9¼ | Not weighed (11 ft. high) | Not weighed (10 ft. high) | .... |
| J. W. Smith, Wauchope | 1 Dec. | ........ | .... | .... | 36 (13 ft. high) | ...... | .... |
| M. Smith, Paterson River | 1 Dec. | 6⅞ | 3¼ | 9¼ | ...... | ...... | .... |
| Alex. Smith and Atkins Bros., Bandon Grove. | 8 Oct. | (Fertilised) 6 | 5¾ | 11¾ | (Fertilised) 22⅛ | 25⅓ (Maize for cow-corn) | .... |
| | | (Unfertilised) 2¾ | Not weighed | 2¾ | (Unfertilised) 22 | | |
| R. Lindsay, Belmore River | 2 Nov. | ........ | .... | .... | 26 | ...... | .... |
| J. Davis, Sherwood .. | Dec. | Not weighed (8 ft. high) | | .... | Not weighed (12 ft. high) | Not weighed (grew 9 ft.) | .... |
| A. J. O'Shea, Belmore River. | 20 Oct. | ........ | .... | .... | 17 (approximate) | ...... | .... |
| W. H. Duffy, Comboyne. | 10 Nov. | ........ | .... | .... | Not weighed (5 ft. high) | ...... | 13 (broadcast) 9¾ (drills) |

* Including a third cutting of 4 tons.

**Local Value of Sudan Grass.**

That this rapid-growing, annual fodder plant thrives under coastal conditions has been proved beyond doubt. Being naturally adapted to dry conditions, its introduction into a district of extreme humidity and dampness was accompanied by attacks of blight, but using the crop primarily for grazing tends to eliminate these attacks. Used in this way, Sudan grass certainly is a valuable addition to our summer crops.

Feeding off when about 2 feet high encourages stooling. An almost continuous supply of fodder can be made available from November to May, especially when sown in two or three paddocks, each of 2 or 3 acres. To show with what rapidity growth takes place, it may be mentioned that at Mount George the first growth reached 8 feet in eleven weeks, and the second averaged 2 feet 6 inches in ten days. At Mondrook and Sherwood similar growth took place. At Paterson (hillside soil) the crop grew 3 feet in four weeks, and 5 feet in seven weeks. Fifty cows were grazed for seven days on 2 acres. A fact worthy of emphasis is that the milk yield in all cases increased considerably.

**Saccaline.**

Saccaline has become firmly established with dairymen on the central coast. Although maturing slightly later than Planter's Friend, it made a better showing than that well-known fodder in almost every other way, growing taller, yielding more heavily, and proving more palatable to dairy cattle, which showed marked preference for it when both were fed together. Saccaline's greater succulence and sweetness, and the manner in which it retains these qualities after severe frosts, should recommend it to dairymen. Another strong feature is its resistance to rough weather. Plots sown December, 1919, still remain standing (October, 1920). Like other sorghums, Saccaline is subject to red discoloration. This detriment was not so noticeable last season on the extremely rich soils as on soils of lesser fertility, or where sown on uplands, the reason probably being that a greater degree of succulence, and a less percentage of sugar, is present when grown on rich soils.

**Japanese Millet.**

This is a valuable milk-producer that is very little sown on the central coast; its value lies chiefly in its being ready for grazing earlier than other spring fodders. It should be broadcasted (mid-August to the end of August), and the growths should be fed off when about a foot high. For low-lying areas or sour soils, Japanese millet shows greater adaptability than other crops.

## Canada's Necessity—and Ours.

There is great necessity in this country for a vigorous and continuous campaign of agricultural education along the lines of better methods of farming, better live stock, better seeds, and better markets.—The Hon. S. F. Tolmie, Minister of Agriculture, Canada.

# Safeguarding Farm Stock from Disease.

## (3) By Correct Feeding.

[Continued from page 730.]

MAX HENRY, M.R.C.V.S., B.V.Sc.

### CATTLE.

Owing to the natural conditions under which the majority of cattle are kept in this country, the diseases associated with feeding are intimately connected with seasonal variations, such as the frequent dry periods and the almost equally frequent, though much shorter, periods of heavy rain and floods, with the consequent rapid growth of succulent green herbage and grass. Forms of disease in which food deficiency, in some form or other, and sudden changes from dry to green feed, play an important part, are very prevalent. This is not the case in countries having an equable climate ; digestive troubles there are principally found in cattle which are stall-fed, and though the number of cattle so treated in this country is only a very small proportion of the whole, it will tend to increase, and some attention must be given to methods of artificial feeding and the digestive troubles incidental to it.

The great influence of proper feeding on productivity, either of beef or milk, and the methods best calculated to maintain and increase this qualification, do not come within the scope of these articles, but before passing to the diseases connected with paddock-fed cattle, some reference will be made to the principles governing stall feeding. Naturally the methods of feeding an animal with a simple stomach of limited capacity, such as the horse, cannot be applied to cattle which have a compound stomach of large size. While the best results are obtained from frequent small feeds to the horse they are obtained by large feeds at longer intervals with cattle. The proportions of concentrated food to bulky food are also quite different, as cattle can deal with far more bulky material, and can usefully ingest food of a fibrous nature, which would be of very little value to the horse. In other respects, however, the same principles apply when the animals are stall-fed.

Regularity of feeding is of great importance, sudden changes of food should be avoided, musty or mouldy food is dangerous, and some care is required to balance the ration from the point of view of disease. Certain deficiencies in many of the natural pastures can well be supplied by some modified form of stall feeding, and disease incidental to such deficiency avoided in that way. Better results will usually be obtained from feeding cattle on a mixed ration than from using one composed entirely of the products of one particular plant.

## Foodstuffs used for Cattle.

The commoner materials used in feeding cattle may be briefly described, although diseases of the digestive tract in cattle which are stall-fed are not so intimately connected with any particular food or foods as is the case with horses. The descriptions are merely examples of the different types of food used, and an approximate idea only is given of the best method of utilising them.

*Lucerne* (*hay or chaff*).—A most valuable food, which, on account of its high nitrogenous content can be largely utilised in place of more expensive concentrated food, and when mixed with corn or other silage and bran, furnishes a very useful ration. A very safe food.

*Silage* (*corn or sorghum*).—A very useful bulk food, but care should be taken that no mouldy silage is fed. Owing to its succulence it is of great value to dairy cattle, and being slightly laxative the digestive tract is kept in good condition by its use.

*Chaff* (*oaten and wheaten*).—A useful bulk food, but requires more concentrates to balance the ration than does lucerne chaff.

*Bran.*—One of the best forms of concentrated food for cows, and of great value in maintaining health by its action on the digestive organs, its mineral content and its power of protecting stock from some disease conditions associated with food deficiency.

*Hay* (*grass and clover*).—Although not much utilised in this country, hay furnishes excellent roughage for cattle, and if made from a mixture of grass and clover is especially valuable. It forms an excellent medium for supplying the long rough feed which is so beneficial to all ruminants and which enables them more perfectly to digest the chaff, bran, and meal which form the larger portion of their food. By improving rumination and digestion this food aids in preventing colic, tympany, and indigestion.

*Corn and Corn Meal.*—Valuable concentrated foods but lack protein ; they are best given with lucerne or clover hay.

*Oats* —Good concentrated food but does not possess the same high value for cattle as for horses. If the ration is well balanced it can replace corn.

*Linseed Meal.*—A concentrated food rich in protein and mineral salts. Can be used to balance much of the lack of protein in chaff. Slightly laxative.

*Pumpkins.*—Useful as part of the bulk food but requires the addition of a considerable amount of concentrates to make a balanced ration. The same thing applies to melons, &c., and roots.

## Diseases Associated with Feeding in Cattle.

*Tympanites—Hoven.*—This is due to the formation of gases in the rumen or paunch, and very frequently follows the feeding of cattle on luxuriant and succulent green food. It is more often observed, even in well-fed stock, when they are first turned on to clover, trefoil, lucerne, and other leguminous plants, but it is more likely to occur if the animals are hungry and are put on to the

pasture in the early morning. Even a small amount of dry food given previously will tend to counteract the likelihood of tympanites occurring, and cattle may safely be put on to growing crops after the sun has been on them for a few hours, even though the same crops might have caused trouble before such exposure to the sun. It should also be remembered that cattle become accustomed to a food, and that the first occasion on which they are put on to these crops is likely to be the most dangerous. Consequently the first day they should be allowed to feed for a few minutes only, and well watched, the time being increased gradually each day. Should rain occur, however, and a fresh, quick shoot result, care will again be required.

The same conditions may result when stock which have been for long on dry food, are first given a quantity of green food of any description; this may occur among travelling stock coming empty on to green, succulent food. The reputation of some plants, such as pigweed (*Portulaca oleracea*), as poisonous, has not improbably resulted from mortality from this cause.

As each case must be dealt with according to local circumstances, the only advice possible is that care should be taken when animals come on to succulent food after a long spell on dry innutritious feed, or after a railway journey during which they have been deprived of food and water.

*Impaction of the Rumen.*—Many cases described under this heading would be more correctly described as atony of the rumen, as the impacted condition not infrequently results from a weakened state of the organ itself. It occurs under two rather different sets of conditions. Cattle which have been for long on a diet of innutritious food of a bulky nature may become so lowered in health, although maintaining fair condition, that what is known as the "tone" of the animal is not up to the standard required for dealing with the food. The digestive tract appears to be one of the first portions of the body to suffer from this lack of tone—the rumen consequently fails to deal properly with the mass of ingesta and it accumulates. Naturally the more the weakened rumen is overloaded the less capable it becomes, and the result is a stoppage of its movements and action. Correction of the diet in the direction of replacing portion of the bulky food with nutritious concentrates, such as grain, meal and bran, represents the best method of relieving the condition, but it must be done in the early stages. Once a weak rumen is heavily overloaded the provision of good food is of small value as it will not be properly digested.

Scrub fed cattle are particularly likely to suffer from a general impaction of the digestive system, including the rumen, partly because of the very low feeding value of any scrub—and this is so no matter how valuable such scrub may be in keeping animals alive through time of drought—and partly on account of the astringent character of many of the plants used in scrub feeding. Scrub alone can only provide sufficient nutriment to keep stock alive, and, as a rule, they steadily lose tone while fed on it. This condition may eventually lead to impaction which, however, may not show until the stock are put to some strain such as travelling, when it may very quickly become evident

Atony of the rumen leading to impaction may also occur among well kept cows which are entirely fed on concentrates and chaff without any admixture of hay or long food, and are, at the same time, deprived of grazing. There is no doubt that ruminants, to maintain themselves in a really fit condition, require a certain amount of rough fibrous material. Lacking the stimulus of this type of food, the digestive organs are apt to become deranged, and impaction results.

*Impaction of the Omasum.*—Generally, this complaint is found following other diseases, but it often occurs as a result of lowered vitality in cattle on dry, innutritious food, when water is scarce, and, in spring and autumn, when fresh grass is shooting among a lot of dry dead stuff. In all such cases, the condition of this organ is probably due to chronic indigestion and derangement of the functions of the system from prolonged dry feeding, and from the change on to green food. Where animals are kept in good tone with regular nutritious feeding, and no other disease is present, the condition is not common.

*Depraved Appetite.*—This is a common occurrence among cattle on coastal areas. The animals devour bones, sticks, stones, dead rabbits, and all kinds of indigestible rubbish. The causes are many and various, the most important, probably, being an insufficiency of certain mineral matters in the soil (dealt with below under the heading *Osteomalacia*), but other cases occur which may generally be ascribed to indigestion from some obscure cause. In all cases the essential line of treatment consists in alteration and enrichment of the food supply, change of paddocks, provision of some artificial feeding, and a supply of salt.

*Osteomalacia.*—This disease is very generally associated with certain poor types of soils, and is usually shown by the bone-chewing habit of the animal. It can best be combated by supplying food fairly rich in mineral salts, such as bran, lucerne chaff, clover hay, or other suitable artificial foodstuff. In addition, sterilised bone meal should be added to the food, as much as 2 oz. per day being given at times. Salt is not very often required by such cattle to any great extent, though with all dairy cattle a supply of rock salt is necessary if they show any desire for it.

It will be noted that the great majority of the diseases of cattle which are associated with feeding—a few of which are mentioned above—are really deficiency troubles in some form or other, and this is the main point it is desired to urge in connection with cattle. It is not necessarily bulk weight which is deficient—it may be nutritive constituents. The scrub-fed cattle, which cannot travel without breaking up, the bone-chewing dairy cow of the coast, and the unthrifty pot-bellied youngsters, are all affected in different ways by some variety of the same thing, and these conditions—and the many other diseases which come more or less directly as sequels to these—can all be prevented by attention to feeding. If grazed continuously and never manured, the natural pastures cannot provide the necessary food material in sufficient quantities during the whole year—certainly not in time

of drought. A gradual impoverishment of many of the grazing lands is thus taking place, and with that impoverishment will come an increase in disease.

The addition of artificially-grown food to the natural pastures must be made if this is to be prevented, and will be required sooner in some parts of the State than others, according to the natural fertility of the country, and the length of time it has been grazed. Those food constituents which are most likely to be wanting are the proteins and mineral salts, and in supplying the former the very great value of the legumes—lucerne, clover, trefoil, and peas—should always be borne in mind. The mineral salts most lacking will be lime salts and phosphates. For the former the leguminous plants are again of high value, and for the latter bran and the oilcakes and meals are useful.

It will be remarked that these diseases are really in contrast to the diseases in horses, which are nearly all due to errors in methods of feeding.

*Poisoning.*—Although often reported, poisoning in cattle is seldom proved, but a few of our native and introduced plants must be held responsible for mortality at times. As instances, sorghum, blue couch, rosewood, and possibly others at times kill by the formation of prussic acid ; certain types of Darling pea cause the well known symptom of a pea-stricken animal; burrawang leads to a peculiar nervous condition commonly, but erroneously, called rickets ; the cape tulip will at times kill cattle unaccustomed to it, and there are many plants which require further investigation before definite pronouncement can be made as to their toxic properties.

Prevention in all such cases is the obvious course, but this is at times impossible, or nearly so. Only with regard to the prussic acid forming plants can effective measures be taken. If cut and dried they are practically harmless, whereas they are most dangerous in young, quick growth, and when stunted and growing up after once being eaten off.

*Indigestion in Calves.*—Owing to the artificial manner in which most calves in dairying districts are reared, indigestion and its consequences, general unthriftiness, diarrhœa, and stunted growth are very common ; these troubles may be due to any one or combination of the following causes:—Overloading the very young animal's stomach through endeavouring to give sufficient nourishment to cause it to thrive in too few feeds ; replacing full milk with skim milk or milk substitutes too early or too suddenly ; giving the feed cold or only slightly warmed instead of at the normal temperature of milk fresh from the cow ; sudden changes of food, as from skim milk to substitutes, and back again ; so feeding a bunch of calves that the little animals gulp it down as quickly as possible to prevent others from getting it ; and giving such a small ration that the calves are driven to eating rough forage, and hay, &c., at too early an age.

In order to prevent disease in calves from improper feeding the following points require attention :—Cleanliness in feeding, which should preferably be from metal receptacles which can be scalded out ; separate feeding of the calves

to insure that each one gets a fair feed and is not unduly hurried; feeding the milk and other material at blood heat; the gradual substitution of skim milk for whole milk, and the replacing of the nutritive material thus lost by meal obtained from cereals or other concentrated food; regularity in times of feeding and of quantity of material used; gradual change of food when necessary, and gradual weaning. The skim milk which is used should be as fresh as possible, since the longer it is kept the more likely it is to be contaminated and so cause diarrhœa. The skim milk, buttermilk, and whey obtained from creameries and factories is particularly dangerous, since the feeder has no control over the possible contamination of the material; it should be pasteurised before being used.

*Tuberculosis.*—Contracted by cattle when young by feeding on the milk and milk products of tuberculous cows, and by grazing over badly contaminated paddocks at a later stage. To prevent infection, stockowners should do everything in their power to get rid of tuberculous cattle, and if using the milk or milk products from mixed herds for the purpose of feeding their calves should pasteurise or boil it.

*Actinomycosis.*—This disease is contracted from the feed, and very little can be done to prevent it except to destroy animals affected, and so prevent reinfection of pastures.

*Grass Seed Abscesses.*—Due to grass seeds penetrating the soft tissues of the mouth. It is difficult to prevent; but overstocking the pastures on which dangerous grasses such as barley grass grow, might effect something.

(*To be continued.*)

## When to Cut for Hay.

Wheat is at the best stage to cut for hay a few days after it is in flower, because at this stage the plant contains the maximum amount of nutritive qualities, which are then also most evenly distributed throughout the whole plant. Though the crop at the flowering stage contains the maximum amount of nutritive matter it has not reached the stage when it will produce the greatest weight of hay. The dry matter in the plant increases until it is mature, and because of this some farmers refrain from cutting the crop until the grain is in the soft dough stage, in order to get a greater quantity of hay, but the extra weight is gained at the expense of feeding value and colour.

"Mow your hay in the proper season, and be cautious that you do not mow it too late," wrote Cato two thousand years ago, and the advice is good yet.—A. H. E. McDonald, Chief Inspector of Agriculture.

There is great opportunity for the young man with initiative and new ideas to help make his community just what he wants it to be. And that is a lot more fun than finding something ready-made awaiting you.—E. T. Meredith, U.S. Secretary of Agriculture.

# Strawberry Culture around Sydney.

[Continued from page 737.]

L. GALLARD, Fruit Inspector.

## Treatment of Beds after First Year.

ALL that has been said up to this point concerns chiefly matters incidental to the strawberries' first year's growth, but if the plot is well cared for it will last for years. Where runners have been left on young beds with a view to sale or planting out, when the plot should be worked or manured will depend a good deal upon when the plants are required. When runners have been kept off with a view to an autumn crop, as soon as that crop is harvested and the winter is over, attention should be directed to the clearing off of all dead leaves and rubbish that would be likely to carry over disease or insect pests to the following season, and to the digging up and manuring of beds. From the middle of June to the middle of July is a good time for this work. A good dressing of manure should be applied, and dug in with a fork or hoe so that it may rot down ready for the spring growth. Either blood and bone (10 lb. to the rod), or its equivalent in farmyard manure, or, if sulphate of ammonia is obtainable, a mixture of this (1 lb.) and blood and bone (8 lb.) may be used. A little more of whichever fertiliser is used may be added during the growing season if there is promise of a big crop, but care should always be taken not to sow blood and bone or any nitrogenous manure too close to the plants in summer time, and whenever such manure is used a good supply of water should be used also. Where vacancies have occurred for any reason they should now be filled.

## Burning off Grass among Plants.

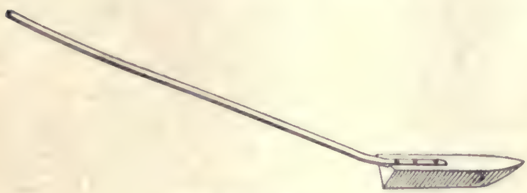
When a light crop of summer grass has grown up around the plants a fire may be run through them; this destroys fungus-infected leaves, and any insects which have been sheltering among them for the winter. It is also generally claimed that it produces a much better colour in the berries for the next season.

Where the crop of grass is heavy it will be necessary to mow off and remove part of it before attempting to burn, or the excessive heat may damage the crowns of the plants. If there are patches without any grass, some of the excess from other places may be sprinkled over them and fired. Care should be taken not to fire where there has been a heavy coat of mulching until that has been removed. In any case it is wise to choose for this work a day when there is a light breeze blowing, so that the flame will pass over the plot quickly. On plots on which no runners are being saved for sale, when the rubbish has been cleared away the spade or some sharp implement should be run along on either side of the alley, just level with the edge of the original plants. When this is done all runners in the alley space can be

dug in, and where runners that are not required have rooted along the single row, or in the matted row, these should now be thinned out. Where an old plant is looking sick, and there is a healthy runner near, leave the runner and pull out the old plant. Sometimes a lot of young seedling plants will come up along the rows. These should be weeded out, as they will not develop true to type, and may spoil the grower's stock. If a grower wishes to experiment with them, with the hope of getting a good new variety, he should plant them out separately.

### Irrigation.

There are many ways of applying water to the strawberry patch. Where the land has a suitable fall it may be run in light furrows made on the top side of the row with a Planet Jr. or with a common hand plough made by fastening to a long handle a three-cornered piece of timber sharpened at the end as shown in the accompanying figure. Throughout Ryde and Pennant Hills, however, sprinkling systems are the most popular. Some growers use a stationary-pipe sprinkler system, some triple sprinklers attached to the end of a length of hose which can be shifted about to any part of the plot. One grower has a service of pipes laid along every second row of trees through the young orchard in which he grows his strawberries, and at every second tree he has a standpipe about 6 feet high with a triple sprinkler on top. This throws a fine set of sprays, which meet and cover the whole of the ground, constituting the nearest approach to actual rain that I have seen.



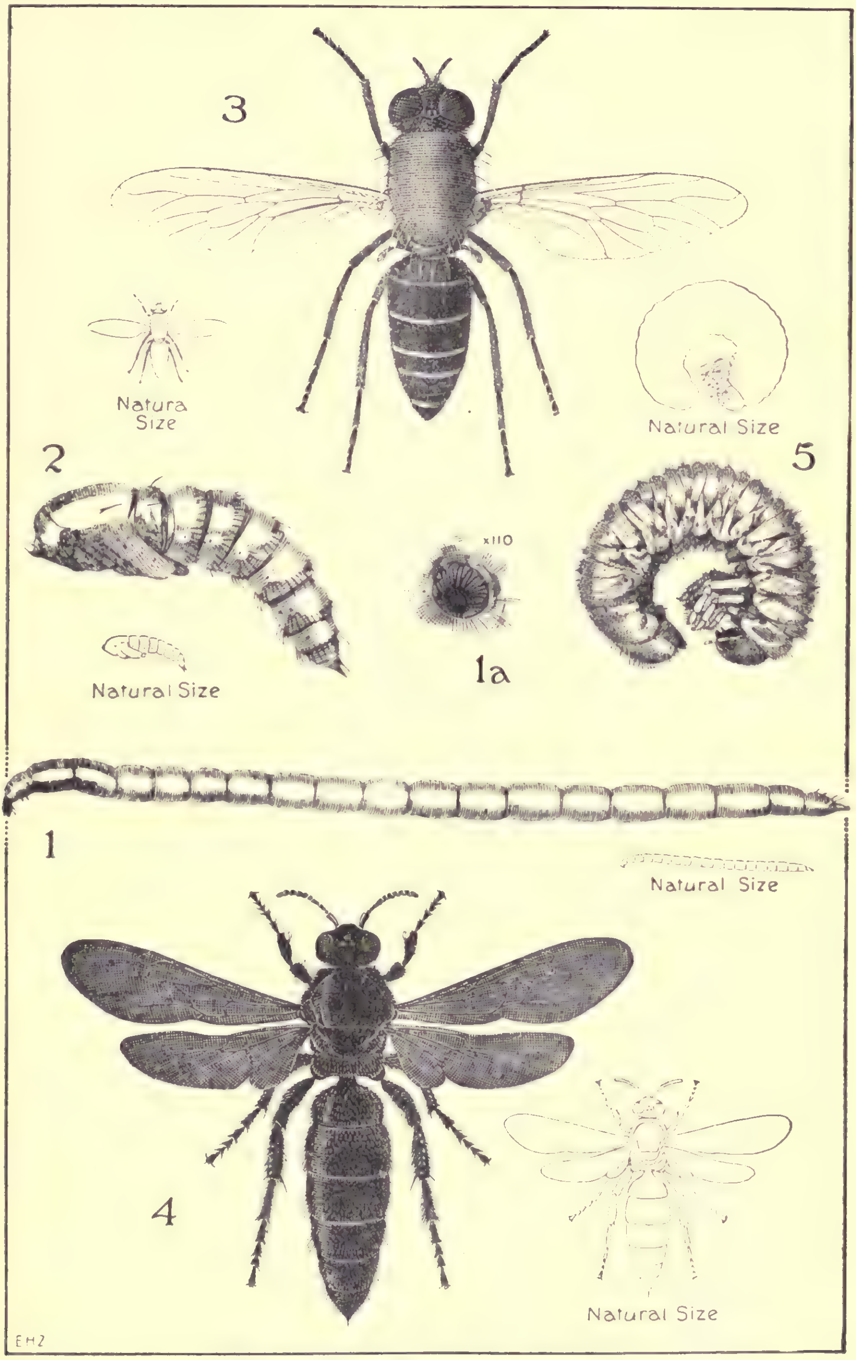
The hand plough.

Another large grower has installed a stationary system of an improved type. This consists of a service of plain pipes laid on the surface, with an inverted T-piece put in as a coupler at every second length. Set in the T-pieces are stand-pipes about 2 feet long, and to the top of these are attached bulb sprinklers which throw a circular spray. These sprays meet, and cover the ground evenly all over. It is claimed by the owner that the 2-foot uprights are sufficiently high where only strawberries are to be watered—high enough to allow the sprays to meet as they fall, and not so high as to cause loss of water through evaporation. The main advantage this has over the ordinary stationary pipe system is that no holes need be made in the piping for nipples, and if the installation is not required after a few years the piping can be disconnected and sold to the plumber for other purposes.

### Diseases and Pests of the Strawberry.

Chief of the fungus diseases of the strawberry are black spot and mildew. For these an early spraying of Bordeaux mixture is the best remedy.

Red spider is another common source of trouble, many hundreds of these small mites attacking the leaves on the under surface and sucking




**Insects of Interest to Strawberry Growers.**

1. Larvæ of Therevid fly (*Anabarrhynchus* sp.). 1a. Posterior spiracles of same.
2. Pupa of Therevid fly. 3. Adult of same. 4. Scolid wasp (*Discolia soror*).
5. Larvæ of Anoplog beetle.

the sap to such an extent that the upper surface of the leaves has a dirty creamy appearance, and the plants suffer severely from loss of vitality. These mites are hard to deal with while the plants are growing, but they can be killed in thousands by burning the tops off with grass (in the way already described) at the end of the season. A nicotine spray is effective where it can be applied without interfering with the fruit, but plenty of water is perhaps the best remedy.

Another strawberry pest is the small weevil which eats the crowns out of the plants occasionally, but I have not noticed much damage being done by weevils in the Ryde and Pennant Hills district. The white curl grubs which are commonly dug up in the ground, and which are the larvæ of several species of beetle, are about the worst pest here, particularly where bush rakings from under eucalyptus trees are used for mulching. These beetles feed on the leaves of the eucalypts, as well as on those of apricot, plum, and other fruit trees, and when feeding on the gum leaves they drop their eggs among the fallen leaves and other rubbish. When the grower gathers the leaves for mulching, he gathers also the eggs of these beetles, and by this means often introduces them into his strawberry plot. On the other hand, when the adult beetles have been feeding on apricot and peach foliage in the orchard close to the strawberries, the soft mellow soil which results from the rotting leaves appeals to them as a most attractive laying ground. When the young larvæ hatch they feed freely on the roots of the plants, and when plentiful will often eat out patches rods wide. This pest has always been with the strawberry grower to a certain extent, but during the last four or five years it has increased in virulence. Sometimes a large bed will be so badly damaged by June that it is found necessary to dig up the remaining plants and transplant them in a new plot. When digging up the old plants as many as possible of the grub larvæ should be destroyed, as if they are allowed to pupate and emerge as beetles the number of eggs laid for the next season will be considerably increased.

So far no effective remedy has been found for white curl grubs. As they feed on the roots only, and do not come to the surface, poisoned baits (as used in the case of cutworm larvæ, which come to the surface to feed) are not practicable. Large growers rely principally on a semi-safety measure consisting of keeping a young bed planted ahead, so that if the old bed gets badly affected they can turn their attention to the new one, and let the first "take its chance." When the season is over and the larvæ have pupated and emerged as beetles, plots that have been infested by the grubs may be used again, but it is wise to crop such plots with something else for one year, as all the grubs may not pupate that year.

As the nature of the strawberry industry renders it almost impracticable directly to adopt spraying and other ordinary combative measures, the grower must turn his attention to some other means of protection, and largely work on the sound principle that prevention—and interception—is better than cure. When a grower who has an orchard close by his strawberry plot finds his apricot and plum trees swarming with golden or grey-coloured anoplog beetles,

he should realise that they are the forerunners of the strawberry pest, and apply his treatment then. This can be done by either spraying the trees with arsenate of lead or Paris green, or by spreading an old sheet under the trees in the early morning or late in the afternoon when the beetles are drowsy, and shaking the tree or brushing it with a bush. By this means hundreds of the beetles can be collected in the sheet and subsequently be destroyed. Another preventive measure is the exercise of some care and discrimination when collecting leaves for mulching. If the grower sees that gum trees have been partly defoliated by beetles early in the spring, he may do well to pass that neighbourhood entirely; otherwise, he should rake very lightly in order to lessen the risk of picking up with the lower decayed matter either the eggs or the tiny young larvæ of the beetles.

Another means of protection of which the grower can avail himself at little cost is the enlistment of the services of useful insects found preying on the pests. Two of these may be described.

The first is the large metallic blue scolid wasp (*Discolia soror*), which can be seen flying about the strawberry bed almost anywhere in summer, and which, if watched, will be seen to burrow her way into the soft porous ground to deposit her eggs on the larvæ of the beetles. These young wasp larvæ when hatched, attach themselves to the grubs, and feed upon them until fully matured. They then roll themselves up in an oval-shaped silken cocoon, and lie in the ground until the warmth of the coming spring causes them to pupate and emerge as wasps again. It is quite a common occurrence to find a grower killing these wasps—sometimes because he has been stung by one when interfering with him—sometimes because, seeing the wasp enter the ground, he has suspected him of being another pest. This wasp can sting, but it is perfectly harmless if left alone, and is really one of the strawberry-growers best friends.

The second of our friends is a Therevid fly; it is illustrated on page 817. Hitherto very little has been known of its life history, and therefore it has not been given its place in economic entomology, but I have for two years collaborated in the study of this family, and have found its larvæ to be very widespread. This larvæ is very voracious, and will attack almost any soft underground larvæ; indeed, such is its habit, that one cannot keep two in one jar for half an hour without running the risk of one sucking the other to death. I have reared the flies in captivity for the last twelve months, feeding them almost exclusively on curl grubs. I found them among the larvæ of the dicky rice last year, and in collecting grubs from among strawberries this year for food for them I found that there also they were operating pretty freely. I would therefore strongly recommend every grower to make himself acquainted with the appearance of this fly, and whenever he comes across him when killing others to spare his life. These two friendly insect agents can operate all through the season without interfering with the crop in any way, and though they should not be expected to do more than their share of useful work, they may nevertheless assist the grower materially in turning the balance of nature in his favour.

## Do Strawberries pay?

Do strawberries pay? Let the reader dip into the appended table for a reply. In its columns are set down the yearly returns from a number of strawberry plots in the North Ryde and Marsfield districts.

TABLE showing yearly returns from strawberry plots in North Ryde and Marsfield district.

| Year. | Locality and Area of Plot. | Number of Punnets Marketed. | Amount received for Fruit. | Amount received for Runners. | Amount received for Jam Lots. | Total Receipts. | Expenses. | Net Return. |
|---|---|---|---|---|---|---|---|---|
| | | | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| 1919 | North Ryde, ¼-acre (strawberries only; intense culture). | 2,303 | 110 0 0 | 11 0 0 | .. | 121 0 0 | 25 0 0*a* | 96 0 0 |
| 1920 | North Ryde, ⅜-acre | 2,761 | 147 15 7 | *b* | 12 0 0 (Manufactured at home and sold). | 169 15 7 | Not available | .. |
| 1920 | North Ryde, 1-acre (strawberries only; intense culture). | 11,000 | 500 0 0 | 20 0 0 | .. | 520 0 0 | 200 0 0*c* | 320 0 0 |
| 1918 | Marsfield, 50 rods (side crop in orchard). | .. | 54 0 0 | 7 0 0 | (All inferior fruit used at home) | 61 0 0 | Not available | .. |
| 1918 | Marsfield, 95 rods (side crop in orchard).*d* | .. | 97 0 0 | 5 0 0 | | 102 0 0 | | .. |

(*a*) The punnets and manure cost £20 and water £5.
(*b*) A sum of £10 received for autumn leaves is included in the total, but no allowance is made for 6,000 runners used for planting a new bed.
(*c*) Including wages paid for extra labour.
(*d*) This plot was planted in an old vineyard, in which the clay had been brought to the top; the plot had a southerly aspect.

## VEGETABLE GROWING ON THE MURRUMBIDGEE IRRIGATION AREAS.

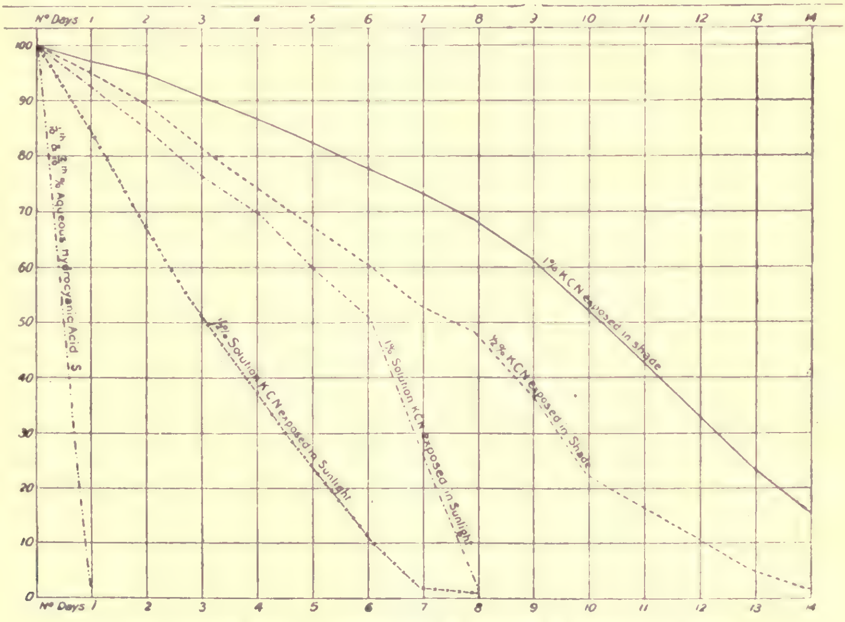
VEGETABLE growers on the irrigation areas find that the soil (especially the heavier soil) sets very hard after watering, and requires a great deal of work to bring it to a proper tilth. A dressing of gypsum at the rate of 1 ton per acre has been found to have considerable effect in correcting this tendency. It has been noticed that land so treated shows increased capacity to retain water, and that, unless water is allowed to remain on it for a long period, it does not set.

The drawback to the use of gypsum seems to be that its application has no lasting effect. Nevertheless, if good results were obtained over a short period, the saving in labour and in water would probably be sufficiently appreciable—especially during the warmer months—to warrant the use of gypsum in this way.—A. N. SHEPHERD, Assistant Inspector of Agriculture.

# Potassium Cyanide for Trapping Fruit-flies.

A. A. RAMSAY, Principal Assistant Chemist.

At the last conference of the field staff of the Fruit Branch of the Department of Agriculture, attention was drawn by one of the field officers to the successful use of weak solutions of potassium cyanide as a bait to trap fruit-flies, and a recommendation was made that investigations be carried out to ascertain the rate of alteration or decomposition occurring in potassium cyanide solutions when so used.




Graph showing Rate of Decomposition in solutions of Potassium Cyanide.

The experiments were designed as follows :—

1. Aqueous solutions, containing ½ and 1 per cent. respectively of potassium cyanide were made up, and the amount of cyanide present was determined. These solutions were kept in a cool cellar, and the amount of cyanide present was determined from day to day.

2. Aqueous solutions containing ½ and 1 per cent. respectively of potassium cyanide were prepared and treated as above described, except that the solutions were kept in the open freely exposed to sunlight, and as nearly under field conditions as possible.

3. Aqueous solutions (distilled water) containing $\frac{1}{10}$ and $\frac{2}{10}$ per cent. of hydrocyanic acid were exposed as nearly under field conditions as possible, and rate of decomposition noted. The last-mentioned solution ($\frac{2}{10}$) contains the same amount of hydrocyanic acid as does a ½ per cent. solution of potassium cyanide.

The results obtained are expressed in the accompanying graph, which indicates the amount of cyanide (or of hydrocyanic acid) remaining at various intervals of time, that originally present being taken as 100. It will be noted that ½ per cent. solution of potassium cyanide exposed in the shade decomposes almost completely in fifteen days, and a 1 per cent. solution in seventeen days. When exposed to the action of both light and air, the rate of decomposition is much increased, a ½ per cent. solution decomposing almost completely in seven days, and a 1 per cent. solution in eight days.

In the case of aqueous hydrocyanic acid solutions exposed to light and air, decomposition takes place within twenty-four hours.

## Pig-fattening Experiments with Dried Blood.

Experiments were recently instituted by the Food Investigation Board of the Ministry of Agriculture, England, with a view to determining the value and safety of dried blood as a nitrogen-supplying portion of a fattening animal's ration. Results of previous trials with dried blood had indicated its food value when added to a mixed diet, and this experiment was restricted to the effect of blood as an addition to a carbohydrate diet.

Twenty-eight pigs were selected and divided into four lots of seven pigs each, each lot being arranged to average, as nearly as possible, the same total live weight, and to include two "large white," one "large black," and four crossbred pigs. The four pens of seven pigs were fed as follows:—Lot 1, wheat offals only; Lot 2, maize meal only; Lot 3, wheat offals and dried blood; Lot 4, maize meal and dried blood. In addition, each pig received ½ oz. bone meal daily.

The amount of blood fed to each pig in Lots 3 and 4 was 2 oz. per day to begin with, rising gradually to 6 oz., an average of 4 oz. per day. It took two or three days before the pigs tolerated the blood, but they eventually took it willingly.

The pigs were weighed at weekly intervals, and after eleven weeks' feeding made a gain of 218 lb. in Lot 1, 283 lb. in Lot 3, and 207 lb. in Lot 4, and a loss of 3 lb. in Lot 2. The pigs in Lot 2 showed very little appetite, and after a week or two took their ration of plain maize meal with reluctance, and only when pressed by hunger. The results obtained indicate that the addition of blood to an ordinary farm ration of wheat offals may cause a very considerable gain in weight compared with the results obtained from a farm diet of offals only, while the addition of blood to plain maize meal may give an increase equal to the results obtained from feeding offals only.

# The Production of Bees-wax.

W. A. GOODACRE, Senior Apiary Inspector.

BEES-WAX, in the first instance, is secreted by the worker bees through scales in the lower portion of the body, and to enable the bees to secrete wax to any extent a good supply of honey or syrup must be consumed. There appears to be no definite basis of calculation as to the consumption of honey necessary to produce 1 lb. of wax, but it has been proved by tests that the assistance given to the bees by using full sheets of comb-foundation is so considerable, that—apart from its other advantages—the practice pays. It can be said that a certain quantity of wax could be produced naturally during heavy honey flows without noticeable loss, but to provide for this, and make extra wax production possible, the practical apiarist has to adopt the wider spacing for extracting combs, which, when built out, are cut down to normal again during extracting. Also, there is usually a number of new combs to build out from foundation.

The market for good quality bees-wax is almost invariably good, yet there is much waste of this valuable product in many localities—and usually through neglect to melt up surplus or damaged combs, or, if the melting is done, to carry out the operation properly. With a small wax press (described later), £4 to £5 may be earned in a day by treating damaged combs, so that even with a small quantity it pays to treat such combs properly. The careless bee-keeper often spreads disease to a neighbouring apiary by leaving about old damaged combs, frequently allowing combs attacked by wax moths to go to waste, and afterwards purchasing foundation at a high price. In seasons after drought more care than usual is necessary. Let the apiarist who has unsatisfactory or damaged combs serve his own interests by melting them up, thereby (1) keeping the locality clean, (2) minimising the risk of spreading disease, and (3) increasing his production of wax and his returns. Under the Apiaries Act, wax moth is a proclaimed disease, and with infested combs on hand apiarists are likely to meet trouble when the inspector calls.

When bees are building comb they hang in narrow graceful clusters. Hanging thus, when strips of foundation are used, the cluster acts as a kind of plumb-line. As the bees build in the line in which they hang, the necessity of keeping the hives level will be obvious, though a slight dip toward the entrance is not of importance.

The natural colour of bees-wax is yellow, but by bleaching it can be lightened in colour even to pure white. Wax can be bleached by moulding it into thin sheets, and exposing these in the sunlight. Dark colour in wax may result if rusted iron or galvanized vessels are used for melting.

Where a patent cappings reducer is used, the wax is melted and separated from the honey as the work of uncapping the combs proceeds. In this case, when the blocks of wax so produced are cool, they should be put through a refining process before being sent to market. Where no cappings reducer is used, a wax extractor is useful for melting the wax from the strained cappings.

Melting combs is considerably more difficult than the treatment of cappings, but it pays to make a good job of it. Where large quantities are to be done it is advisable to install a different plant to that which would suffice for the apiarist in a small way. For the ordinary apiarist, or where a small number of combs are to be melted annually, the plant required would be a few kerosene-tin buckets, and a small wax press complete. A fair-sized vat with a tap or gate at the bottom is also desirable, A good supply of water should be available; clean, fresh water of any description will do, providing it is not mineralised.

The procedure is as follows:—Stand the kerosene tins on bricks built up about a foot, so that a fire can be built under the tins; then a little over half-fill the tins with water, and proceed to heat. Put in the tins sufficient comb to make a free mush, and allow this to stand at about boiling point, stirring occasionally until well melted up; then pour a quantity into the press, which has previously been kept warm and contains a straining cloth. Small quantities of the melted mass, with a fair supply of the hot water, give the best results. When a sufficient quantity is in the press, fold the straining-cloth neatly over and apply the screw pressure gradually. After applying the first pressure and allowing to stand for a time, ease the screw sufficiently to allow the hot water to get over the slum gum; then apply the pressure again, leave the hard pressure on for a few minutes, and tip the press forward, draining the water and wax into a bucket, which is then emptied into the vat. The slum gum is removed from the press and the remaining quantities of melted comb treated. When the melted comb from the tins on the fire has been treated, the hot water can be drained from the vat into the melting tins again, and a start made with a fresh lot of comb. After completion of the day's work the wax can be drained from the vat into moulds, which should be placed in warm water and covered to allow the necessary slow cooling. To obtain a high grade wax, the blocks of wax from the moulds when cool should be cleaned at the bottom, and then properly refined.

A few hints for the operator:—(1) Do not allow the wax to boil over; (2) have convenient handles in the tins on the fire so that they can be lifted off readily; (3) have an extra tin of water on hand to douse the fire if necessary (although there should be no trouble if care is taken); (4) soak very old combs in water overnight to soften the cocoons so that they will not hold the wax.

### Melting Large Quantities.

Where large quantities are to be melted annually, the apiarist's outfit should include a steam boiler and two fairly large wooden casks fitted with taps—one cask with a tap near the bottom, and the other with two taps, one near the bottom and another a little over a quarter-way up. Steam pipes connect with the boiler and run into the casks.

The cask with the one tap is half-filled with hot water, and steam turned on to keep it hot, and the frames immersed and twisted about in the water until the combs are removed. By this means the combs are removed quickly and cleanly. Meanwhile the wax press (preferably a steam one) should have been prepared, the preparation consisting of pouring hot water into the bottom compartment and keeping it hot by means of either a primus stove or steam from the boiler, putting a straining-cloth in the press and placing a fair-sized bucket under the spout. A quantity of the melted mass (not a large quantity, and with plenty of hot water) is then put into the press, the straining cloth neatly folded, and pressure gradually applied and maintained for a while. The hot water and wax are emptied into the second cask, and steam turned on. When the melted quantity has been treated, the hot water can be drained from the wax through the bottom tap and returned to the first cask, and further melting of the comb proceeded with. When the day's work has been completed, the wax and hot water will be in the cask containing the two taps. Drain the water from the bottom tap, until the wax is just below the tap above; the wax can then be drained into moulds with flanged sides. The moulds containing the wax should be placed in hot water to ensure slow cooling, and the sides of the moulds should be smeared with glycerine to prevent sticking. For a high-grade sample it would be advisable, on completion of all melting operations, to refine the whole quantity. The slum gum from the press can be tested to see if it is worth a second treatment, by again putting a small quantity through the process of melting and pressing.

### To Refine Bees-wax in Small Quantities.

A fair-sized tinned vessel is a quarter filled with water and the blocks of wax (which have previously undergone the treatment already described) added. The vessel is then heated and the wax melted slowly but thoroughly, the fire withdrawn, and the wax allowed to stand (well covered) in a warm room for a few hours. It is then drained off from the top into suitable moulds until the underlying impure matter is reached. The moulds should have flanged sides previously smeared with glycerine, and when containing the wax should be placed in warm water to ensure slow cooling. When properly cooled off the wax is removed from the moulds and any adhering impurity scraped off.

### For Larger Quantities.

When larger quantities of wax are to be refined, steam and the cask with two taps previously described should be used. The water is poured in to just below the top tap, and about a quarter of a pint of sulphuric acid for, say, 10 gallons of water and 250 lb. of wax added. The acid is used to clarify the wax. Needless to say, care should be exercised in its handling. Turn on the steam and when the water is hot put in the blocks of wax, which should then be melted slowly but thoroughly, and stirred occasionally. When melted, turn off the steam, cover the cask and allow it to stand for a few hours;

then drain off from the top tap into moulds to be treated and cooled as previously mentioned. The small cake of wax left in the cask below the tap can be lifted out when cool, cleaned of impurities, and held over for the next lot.

To expedite the work of cleaning wax from utensils, kerosene will be found of service where its use is practicable.

### Adulterated Wax.

Persons have sometimes tried to sell adulterated wax—usually a mixture of tallow or paraffin—but since the adulterated article is easily detected under the specific gravity test and generally results in a loss to the seller, very little adulteration is carried on nowadays.

## An Experiment in Artificial Fertilisation.

Interesting experiments in drone egg fertilisation are described by Mr. Gilbert Barrett, of Sheffield, England, in a recent issue of *The Bee World.* The egg of the bee is almost unique, remarks the author, inasmuch as the fertilising element from the male enters from the outside of the egg after the latter is fully formed and immediately prior to its extrusion by the queen; it is this fact that makes artificial fertilisation possible, and without the aid of elaborate and costly appliances. By means of such fertilisation the egg laid by the queen bee—which would ordinarily produce a drone—can be made to produce a worker larva, which, by the application of queen-raising methods, can subsequently be made to produce a queen.

Freshly laid drone eggs from a pure golden queen were first secured by placing a frame of clean drone comb in the centre of a strong stock; the comb containing these eggs was then cut down, and pure Punic drones just arrived in the hive from a flight were squeezed on to a warm glass plate. The latter operation demands some practice before the spermataphore can be ejected, says the writer, and it was with a view to making the operation easier and the results more certain that the moment of arrival from flight was chosen, the air sac being then fully distended. It is also important that operations in connection with artificial fertilisation should be conducted at a temperature of not less than 95 deg. Fah., which somewhere approximates to the internal temperature of the queen's body.

The next operation was to touch the large end of the eggs with a camel-hair pencil, previously dipped in the male sperm from the glass plate. The eggs were then placed in an incubating chamber (a small poultry incubator), and the temperature in this was maintained at 97 deg. Fah. The next day and on the day following a little royal jelly, slightly thinned with new honey, was added, and the larvæ were further fed with royal jelly for two days after hatching. The transfer to artificial queen cups was then effected, these being given to a queenless and broodless stock of bees. They were duly accepted and capped over, and resulted, says Mr. Barrett, in perfect queens.

Experiments such as that described, which point a way to the practice of direct selection in breeding, are very valuable; and further accounts of research in this direction will be keenly looked forward to by apiarists.—W. A. Goodacre, Senior Apiary Inspector.

# Poultry Notes.

## NOVEMBER.

JAMES HADLINGTON, Poultry Expert.

WE are now approaching the months when the skill and vigilance of the poultry-farmer in picking out and marketing old stock to the best advantage will often mean the difference between profit and loss from flocks of layers. On too many farms there is a good deal of laxity in the matter of marking different ages of hens, and this becomes a very great drawback to the proper identification of hens that should be marketed as soon as they go off laying, the result being that large numbers are carried for many months beyond their profitable age.

It is during the coming months that loss is most likely to result in this way. For instance, many hens in their third year of laying will now be going off after the flush laying period. A large number of these birds will not again become profitable—hence the more than ordinary necessity in these times of high cost of feeding to cull out all such hens.

It is not a difficult matter to distinguish the hen that is laying from the one that is not. A person having only a little experience will know that freshness in colour of comb and wattles indicates that the birds showing up well in that respect are invariably in laying condition, while the reverse indicates that they are either off laying or are going off. There are, of course, exceptions where hens remain more or less fresh in comb and wattles after ceasing to lay; but if such hens are examined the pelvic bones will be found to be closed, except in very rare instances. For general purposes these indications will be some guide to correct culling. A systematic examination of hens at frequent intervals will enable the farmer to market the non-layers as they go off.

As far as hens in their second year are concerned, a good deal of discrimination is necessary in culling them so early as this in the season, because the cessation of laying might be only of a temporary nature, and particularly with hens that have been "broody." Again, hens that fall into moult before the end of February are not likely to prove profitable as layers, but hens finishing their third year of laying should be marketed as soon as they go off laying and not be carried over for months (as is often done) with the hope that they will come on to lay again.

The poultry-farmer needs both experience and discretion to cull to the best advantage. If hens are marketed that would lay eggs to a value that would exceed their keep, then there is loss on that account, while non-laying hens become a burden to the profit and loss account of the flock. When the cost of feeding hens is 3d. to 3½d. per week, as at present, it becomes a serious matter to carry a number of non-producers. Every fifty hens so carried represent a loss of 12s. 6d. to 14s. 7d. per week. Experience

proves that from November onwards a good deal of culling out can be carried on without materially reducing the egg supply. Moreover, the accommodation is usually required for growing pullets.

### Mistaken Ideas about Culling.

In this connection culling is not a process to be attended to only once in a year as some appear to think, but to be effective and economical it should be extended over some few months, say November to May. As a matter of fact, it may profitably extend more or less over the whole of the year where a large number are carried, because from various causes hens cease to be profitable layers at different ages. This is shown even in first-year hens, which at different times of the year go off laying in the competitions. How much more so with second and third year birds? Such hens become a handicap to the average laying of the flock, and a loss to the owner. The indications that a hen is off laying might be stated as follows:—

1. Comb and wattles loose their fresh appearance and are often shrivelled up.
2. The hen is less keen for food, and exhibits a noticeable falling off in the consumption of shell grit.
3. The pelvic bones, instead of being pliable and open and sufficiently wide to allow the passage of an egg, are closed together and often rigid. The latter condition is often an indication that the hen has been off laying for some considerable time.

The causes of the above condition may be set down as follows:—

1. Age.
2. Loss of good health from any cause, temporarily or permanently.
3. Seasonal conditions, such as cold or even extremely hot weather.
4. Moulting.
5. Insufficient or unsuitable food. In this connection, the writer has seen many flocks of hens fed so sparingly as to keep them only existing and in a fair measure of health, but without sufficient food for the production of eggs.

### Concerning Fat Hens.

It might be expected that the "fat hen" would be mentioned in this category as a sixth cause for hens not laying, or perhaps as one of the principal causes, that being a very popular theory to account for hens going off laying, though it is a theory that has little foundation in fact. The facts are that the hen that puts on too much fat or flesh, or both, is usually a poor layer, but the trouble is a constitutional one, and is not to be solved, as is often supposed, by under-feeding. If such a hen does not get sufficient food to meet her constitutional requirements she will not lay eggs. If the "fat hen" does not lay (and she often does) while she is being well fed, she will most certainly not lay when insufficient food is given.

Then, again, if an attempt is made to reduce condition by under-feeding for a period with the hope that the trouble will be overcome and the hens brought into laying condition again, nothing but disappointment can result. No permanent remedy will be found, because just as soon as full

feeding is again brought on the same condition will reappear. Small enclosures with no means of inducing exercise will accentuate the tendency to put on flesh.

Any attempt to deal with fleshy hens in an ordinary flock will interfere with the proper feeding of the whole. In short, if hens are over fat and do not lay they are fit subjects for culling out.

### Reserving Stud Birds.

The altered conditions of the poultry industry will need to be carefully studied by the poultry-farmer if the best commercial results are to be obtained. A large section of poultry-farmers sell stud stock, but another section market all their cockerels except those reserved for their own use, and keep the pullets as layers.

Under present conditions it is questionable which practice is the more profitable. To a large extent, of course, it depends upon individual circumstances, but certain points must be taken into consideration. The poultry-farmer who aspires to sell stud stock must be prepared to reserve his earliest hatched birds for this purpose. These are the birds that command such high prices early in the spring if sold as table poultry, and that have been profitable even under the present high cost of feeding.

Now let us see what happens when these same birds are kept to be sold as stud birds. First, it should be taken into consideration that, allowing that the parent stock is good, the prospects are that not more than one-third, and probably only about one-fourth of even the early hatchings (and much less of the later hatched cockerels) will be good enough to sell as stud birds, and the balance cannot of course be sold as table birds at the griller stage, because their quality as stud birds has not yet been determined. A small percentage might be culled out and sold at four to five months, but much the largest number must be kept to select from, because many of the faults in a bird are not apparent until he commences to mature, say, six to nine months. From seven months onward the average run of cockerels are worth less as table poultry than at five to six months of age. Depreciation in value and loss in numbers through fighting and other causes of wastage is then going on, until the larger part of the birds are sold either as table birds or for stud purposes. There is usually, then, a balance of "staggy" birds to be quitted at what they will bring. These are a very serious set-off to the higher prices made for stud birds.

It will therefore be seen that, however attractive the stud bird business might appear, unless it is carefully handled it might be better to sell as table poultry. In this connection it is to be feared that owing to high prices early birds have already been marketed instead of being reserved for stud purposes, and many later hatched ones will be kept to be used in the pens that will be inferior and immature for the purpose.

As a guide to reserving cockerels it might be stated that the number reserved for stud birds should be about three to one for every one that will be required, and this after a culling at four months old. Thus if a farmer requires ten cockerels he will need to keep thirty early ones to select from.

# Orchard Notes.

## NOVEMBER.

W. J. ALLEN and S. A. HOGG.

As this season has been a wet one, necessary cultivation has been delayed, but it should at once be taken in hand and all weeds ploughed under. The cultivator should be kept going from now onwards, for it will be the main factor in the ultimate returns. Places that are inaccessible to the plough should be worked with some such implement as a forked hoe. After rain, care should be taken to work up the soil thoroughly and leave it as a loose mulch.

Cherries will be ready for gathering in the earlier districts, and in picking care should be taken to allow the fruit to remain on the stalk. It is strongly recommended that cherries should be picked in the early morning when it is cool, but it is not advisable to pack the fruit while it is damp.

### Thinning-out.

During this month it will be found necessary in many cases to thin-out the fruit, particularly apricots, peaches, and plums. The thinning may be delayed until the natural shedding of the fruit has taken place, but that should be over by the beginning of the month. If it is still found that the trees are bearing too heavily, the smaller fruit should be removed at spaces of about 4 inches, and where fruits, such as apples and pears, are growing in clusters, it would be advisable to remove half of the smaller sized fruit.

### Pruning and Disbudding.

Citrus trees may still be thinned-out so as to permit of the circulation of light and air. Although during this process a considerable amount of fruit will be removed, the remainder will benefit by the additional light which will be let into the tree.

If a late crop of passion-fruit is desired, this month is the time to cut back so as to create a second growth.

All trees which have been grafted during the early spring will need attention. Care must be taken not to allow the suckers to absorb the nourishment from the scions, and they should be removed with a sharp knife, as pulling them off, especially near the scion, is apt to leave a wound which has a weakening effect on the grafts. Some grafts, especially in the cases of pears and apples, are subject to the attacks of fungus diseases; this trouble may be counteracted by the application of Bordeaux mixture, summer strength, and it may be necessary to give them several applications.

### Diseases and Pests.

The season having been a wet one, it is almost certain that if summer rains follow there will be a visitation of fungus diseases, such as black spot, mildew, &c. If the necessary precautions have been taken in the shape of

winter sprays, these will to a great extent have eliminated disease, but even so, if the weather is particularly favourable, further applications may be found necessary.

If black spot should be making its presence felt among the vines, a weak mixture of Bordeaux should be applied. If oidium should be at all noticeable the vines should be dressed with sulphur—taking for granted, of course, that this has not already been done.

Every precaution must be taken for the checking of codlin moth among apples and pears. It is now an accepted fact that the use of arsenate of lead when applied in the proper proportions and at the right time will minimise the ravages of codlin moth. All fruit which has been attacked should be picked up and destroyed by boiling or burning. The fruit should be carefully inspected on the trees during the growing periods, and where the presence of grubs is detected the fruit should be removed and destroyed.

As mentioned last month, late applications of lead arsenate are apt to dry in beads on the fruit, and attention is again drawn to the use of soap as a spreader. Last month's notes also gave directions for the combining of a concentrated nicotine extract with the lead arsenate when woolly aphis is attacking the trees.

## The Farmers' Bulletins.

In consequence of the increasing cost of production, the Government Printer has been compelled to impose a small charge for Farmers' Bulletins issued by this Department. For thirty years the publications of the Department of Agriculture have been available without charge (with a very few exceptions), but the expense has latterly become very heavy. When it is recalled that during last financial year nearly 90,000 copies of different bulletins and leaflets were distributed free of all charge, it will be seen that the item has been a substantial one. It is some indication that similar departments the world over have felt the strain in the same way to mention that the issue of publications of many pages without charge has ceased, free issues now being usually limited to a few pages, somewhat like the miscellaneous publications of the New South Wales Department. Probably the old method has been retained longer here than in most other countries. The new system provides for a price varying from 6d. to 1s., according to size. Remittances for these publications should be posted to the Government Printer, Sydney.

## Cleaning of Imported Impure Seed.

In reference to the consignment of impure "mixed grass seed" mentioned in the *Agricultural Gazette* last month, it is satisfactory to know that the importing firm was anxious to have the parcel cleaned before selling it. It was found possible, with special seed-cleaning machinery, to remove practically every weed seed from the sample, and the refuse was destroyed.—E. Breakwell, Agrostologist.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*What method of disposing of the straw of grain crops do you prefer—(a) cutting and stacking, (b) burning off, or (c) trampling down with stock?*

*Discuss the care and management of the flock during summer in respect to (a) shade, (b) licks, and (c) water supply. What steps do you take to ensure each of these? What fodder crops do you grow for your sheep and at what time of the year?*

*What have you found to be the best time to sow maize in your district? Have you noticed that some varieties do better for early sowing than late sowing, and vice versa?*

*How do you combat insect pests in the fowl-house, particularly lice? Do you spray for the control of fowl-tick? If so, with what mixture?*

*What varieties of apples have you found to be most subject to bitter pit? Have you observed cultivation to have any effect on the occurrence of the disease?*

*Lime-sulphur has obtained much popularity as a spray. Do you make it on the farm and what is the method? Do you test the specific gravity before using, and, if so, why?*

*Has the manager of the local factory ever complained of your cream being gassy or fermented? If so, have you ever looked to swampy, low-lying country, or to dust from dirty cow-yards as possible causes? Do you believe in cooling the milk or cream as soon as it comes from the cow or separator as the case may be?*

## REPORTS AND NOTICES FROM BRANCHES.

*NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.*

### Castlereagh.

A meeting was held on 27th August, when there was a large gathering of farmers and business men, and keen interest was manifested in the newly-formed branch.

Mr. Wenholz, Inspector of Agriculture, delivered a lecture on maize culture, which was listened to with attention.

### Clifton (near Young).

On 23rd September, a comprehensive programme for the work of this branch was prepared, covering the next three months. Lectures are to be given by Messrs. A. Strachan, H. Whiteside, and P. Wyndham.

A request was submitted to the Department for an expert to lecture on noxious weeds, and advice has also been sought as to the possibilities of tomato-growing in the district on an extensive scale.

### Cordeaux-Goondarin.

The annual meeting was held on 26th August, about thirty members being present. The secretary's report disclosed that the average attendance at meetings during the year was thirteen, and there was a credit balance of £9. Subscriptions for the year had been increased to 4s. per member.

The achievements for the year included the initiation of a postal delivery to the district; a conference with a view to minimising the losses caused by flying-foxes; the purchase of £300 worth of fertilisers, sugar and spraying materials for members' use; the establishment of potato and maize experiment plots; the improvement in the condition of certain roads, and the donation of a trophy to Wollongong show.

At the conclusion of the ordinary business, Mr. R. N. Makin, Inspector of Agriculture, who was present, gave some seasonable hints on fodder crops, dealing in turn with Saccaline, sorghums, millets, Sudan grass, &c.

A meeting was held on 30th September, when, in addition to general business, it was decided to ask the Postal Department to have a public telephone established in a suitable locality in the district.

### Glen Innes.

A special meeting was held on 29th September, when Mr. H. Wenholz, Inspector of Agriculture, delivered a lecture on maize culture, in which he discussed the methods adopted in the district, and indicated how improvements could be effected. The use of fertilisers, especially of 56 lb. to 70 lb. superphosphate, was confidently recommended, and Early Yellow Dent was advocated as the best variety.

A number of questions were also answered to the advantage of all.

### Inverell.

At the meeting on 24th September further arrangements were made for the exhibit at the next local show, the prospects for which are regarded as most encouraging.

Mr. R. L. Campbell gave a portion of his address on a simple mode of book-keeping for farmers, which was very interesting and instructive, and for which members expressed themselves appreciative.

### Kellyville.

Nearly forty members attended the meeting held on 2nd October. Discussion took place in regard to early pruning of summer fruit. The Department's experience is that late or early pruning does not affect the period of ripening stone fruits. Other useful orchard subjects will be discussed at further meetings.

### Lower Portland.

At a meeting, held on 7th October, much time was devoted to the exhibits to be staged at the next Hawkesbury District show.

It was also announced that over £40 had been raised by the branch, by means of a concert, for the Windsor district hospital.

### March.

A meeting was held on 15th September, when a paper on colic in horses was read by Mr. E. Griffith. The paper covered the subject in various aspects, and made a number of valuable suggestions.

### Matcham.

At a meeting, held on 25th September, a general discussion took place on the advantages or otherwise of different varieties of fruits.

One speaker was of the opinion that the district was more suited to citrus fruits, with apples for the low-lying land as a side-line. Other speakers advocated the growing of apples, which, in some cases, were found to be more profitable. A very interesting discussion took place, and it was decided that at the next meeting a similar interchange of ideas would take place on the subject of persimmon cultivation.

### Moss Vale.

About forty members were present at the meeting held on 24th September. Reference was made to the great difficulty in obtaining supplies of sugar, and it was decided to ask the Department of Agriculture to endeavour to obtain supplies for jam making, &c., this season.

After the ordinary business of the meeting had been disposed of, Mr. E. N. Ward, superintendent of the Botanic Gardens, gave a lecture on horticulture, and answered many questions on spraying, &c.

### Mount Keira.

On 30th September, Mr. W. W. Froggatt, Entomologist, delivered a lecture, illustrated with lantern slides, on pests of the garden and orchard. There was a large attendance of members and others, who followed the lecture very closely, taking keen interest in the different insects illustrated on the screen. Mr. Froggatt also examined a few specimens that were brought along, and answered a number of questions to the profit of all.

### Parkesbourne.

The August meeting of this branch was well attended. A paper was read by Mr. W. F. Weatherstone, on the mare and the foal, and diseases of the horse. The subject was well handled, the ailments with their effective remedies and necessary treatment being fully explained. The diseases referred to were strangles, ophthalmia, drenching, balling, fistula, wither, gripes (or colic), impaction, sand colic, sand cracks, itch, lice itch, and foot diseases.

### Stratford.

The second annual meeting of the branch was held on 21st August, thirteen members being present. The report showed that there was a credit balance of £2 10s. 1d. Ten meetings had been held during the past year, with an average attendance of thirteen members, which, considering the scattered population of the district, is satisfactory. Two meetings were abandoned owing to wet weather. Explosive and pruning demonstrations were given by officers of the Department.

Lime and manures were purchased under the co-operative system, the results fully justifying the expenditure involved.

About 120 books were received during the year from the Public Library, and were circulated among members.

A meeting was held on 25th September, there being a fair attendance of members. The evening was devoted to arranging for a district exhibit to be staged at the Gloucester show in March, 1921. It is understood that special efforts are being made to secure the trophy offered by the Gloucester Agricultural and Horticultural Society for the best exhibit.

### Taralga.

A meeting was held on 29th September. Mr. Whittet gave a lecture on pasture grasses, emphasising the necessity of local tests as a true guide to the worth of any grass. He dealt very fully with Sudan grass.

The lecture was greatly appreciated, and it was decided to ask the Department for a quantity of seeds and roots for distribution among the members.

### Tingha.

The members of this branch met on 4th September, when arrangements were advanced for the exhibit at Inverell show. A paper was read by Mr. J. L. Deasy, on systematic botany, the subdivision of plant-life into various orders and families being discussed, and the usefulness of a good many plants being indicated from this point of view. A cordial vote of thanks was passed.

The annual meeting was held on 2nd October, when both report and balance-sheet reflected a healthy state of affairs The election of officers resulted thus:—Chairman, Mr. G. W. Browning; Vice-chairmen, Messrs. J. Hawkins and E. Cory; Treasurer, Mr. J. L. Deasey; Hon. Secretary, Mr. M. C. Levitt.

Arrangements were made for business for the forthcoming meetings, and the local exhibition fixed for 18th and 19th February.

Other matters were discussed, and useful information on a number of points exchanged.

### Toronto.

A meeting was held on 5th October, 14 members being present. A paper was read by Mr J. Stewart on chicken-raising, much useful matter being included.

Several parcels of seeds for the members were received from the Department.

### Wentworthville.

A meeting was held on 15th September, when Mr. H. J. Rumsey delivered a lecture on vegetable gardening. He indicated how the production of food in this way was one method of reducing the cost of living, and remarked on the unfailing interest that attached to gardening as a hobby. The growth of tomatoes was specially dealt with, much valuable information being given.

Several new members were enrolled.

### Windsor.

A largely attended meeting was held on 20th September, the Mayor, Mr. J. W. Ross, presiding. The Windsor Municipal Council asked the co-operation of the branch in a movement to obtain better railway services on the Blacktown-Richmond line, and it was resolved to accede to the request.

It was decided to make a special effort in connection with the staging of an exhibit at the Hawkesbury District Association's agricultural show, and committees were appointed to represent each section. The branch is considering the holding of an exhibition in Windsor a few days before the local show with a view to obtaining funds and selecting exhibits.

### Woonona.

The membership roll of this branch now numbers 130. At the meeting held in October preparations were made for the annual two days' show, to be held in January next, and a lecture was given by the Entomologist on insect pests in gardens and orchards.

At the November meeting an address is to be delivered on bee culture by Mr. Albert Cavill.

# AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

## 1920.

| Society. | Secretary. | Date. |
|---|---|---|
| Lismore A. and I. Society ... ... ... ... | H. Pritchard ... | Nov. 10, 11 |
| Tweed River A. Society ... ... ... ... ... | T. M. Kennedy ... | ,, 24, 25 |

## 1921.

| Society. | Secretary. | Date. |
|---|---|---|
| Albion Park A. and H. Association ... ... ... | H. R. Hobart ... | Jan. 14, 15 |
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| Gosford District A. Association ... ... ... | H. G. Parry ... | ,, 21, 22 |
| Kiama A. Society... ... ... ... ... ... | G. A. Somerville... | ,, 25, 26 |
| Nimbin A. and I. Society ... ... ... ... | W. P. Stanger ... | Feb. 2, 3 |
| Wollongong A., H., and I. Association ... ... | W. J. Cochrane ... | ,, 3, 4, 5 |
| Cobargo A., P., and H. Society ... ... ... | T. Kennelly ... | ,, 9, 10 |
| Shoalhaven A. and H. Association ... ... ... | H. Rauch ... | ,, 9, 10 |
| Central Cumberland A. and H. Assoc. (Castle Hill)... | H. A. Best ... | ,, 11, 12 |
| Ulladulla A. and H. Association (Milton) ... ... | R. F. Cork ... | ,, 16, 17 |
| Guyra P., A., and H. Association .. ... ... | P. N. Stevenson... | ,, 16, 17, 18 |
| Blacktown and District A. Society ... ... ... | J. McMurtrie ... | ,, 18, 19 |
| Wyong District A. Association... ... ... ... | E. H. Chapman ... | ,, 18, 19 |
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| Bangalow A. and I. Society ... ... ... ... | W. H. Reading ... | ,, 22, 23 |
| Yanco Irrigation Area Agricultural Society ... ... | R. Tribe ... ... | ,, 22, 23 |
| Southern New England P. and A. Association (Uralla) | H. W. Vincent ... | ,, 22, 23, 24 |
| Dorrigo and Guy Fawkes A. Association ... ... | A. C. Newman ... | ,, 23, 24 |
| Tumut A. and P. Association ... ... ... ... | T. E. Wilkinson... | ,, 23, 24 |
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| Nepean District A., H., and I. Society ... ... | C. H. Fulton ... | ,, 25, 26 |
| Tamworth P. and A. Association ... ... ... | J. R. Wood ... | Mar. 1, 2, 3 |
| Manning River A. and H Association (Taree) ... | R. N. Stow ... | ,, 2, 3 |
| Mirrool (M.I.A.) A. Society (Griffith) ... ... ... | F. A. Browne ... | ,, 2, 3 |
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| Oberon A., H., and P. Association ... ... ... | C. S. Chudleigh ... | ,, 3, 4 |
| Hunter River A. and H. Association (West Maitland) | E. H. Fountain ... | ,, 3, 4, 5 |
| Berrima District A., H., and I. Society (Moss Vale)... | J. W. Kenny ... | ,, 3, 4, 5 |
| Camden A., H., and I. Society ... ... .. ... | A. E. Baldock ... | ,, 3, 4, 5 |
| Bellinger River A. Association ... ... ... ... | J. F. Reynolds ... | ,, 4, 5 |
| Mudgee A., P., H., and I. Association ... ... | E. J. Hannan ... | ,, 8, 9, 10 |
| Glen Innes P. and A. Society ... ... ... ... | Geo. A. Priest ... | ,, 8, 9, 10 |
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| Royal Agricultural Society of N.S.W. ... ... | H. M. Somer ... | ,, 21 to 30 |
| Upper Manning A. and H. Association (Wingham)... | D. Stewart .. | April 13, 14 |
| Narrabri P., A., and H. Association ... ... ... | C. C. Baker ... | ,, 13, 14, 15 |
| Clarence P. and A. Society (Grafton) ... ... ... | L. C. Lawson ... | ,, 13, 14, 15, and 16 |
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| Dungog P. and A. Association ... ... ... ... | W. H. Green ... | ,, 28, 29, 30 |
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THE

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# PROSPECTUS

OF

# New South Wales Government Loan of £3,000,000.

**RATE OF INTEREST, 5½ PER CENT. PER ANNUM.**

**PRICE OF ISSUE: PAR. (Payable in Instalments).**

**Interest Payable 1st June and 1st December.**
**A Full Six Months' Interest will be Payable 1st June, 1921.**
**Principal Repayable at Par, in Sydney, 1st December, 1930.**
**List of Applications closes Monday, 3rd January, 1921.**

The Government of New South Wales offers for subscription a loan of £3,000,000, bearing interest at the rate of 5½ per cent. per annum, and having a currency of 10 years from 1st December, 1920, a guarantee being given that the interest will be free of both New South Wales and Federal Income Taxes.

The loan is being raised under the authority of the Act of Parliament, No. 27 of 1919, and is for the purpose of providing funds to be applied towards the completion of the North Coast Railway, the Railways from Dubbo to Werris Creek, Glenreagh to Dorrigo, and Canowindra to Eugowra, Hydro-Electric Schemes for South-west Riverina and North Coast, and other Public Works and Services.

Applications for the loan should be addressed to the Colonial Treasurer, The Treasury, Sydney.

The principal is payable in instalments, as follows, viz.:—

**£25 per cent. on Wednesday, 1st December, 1920;**
**£25 per cent. on Monday, 3rd January, 1921;**
**£25 per cent. on Tuesday, 1st February, 1921;**
**£25 per cent. on Tuesday, 1st March, 1921;**

and will be accepted free of exchange.

Applications made after 1st December, 1920, must be accompanied by interest at 5½ per cent. per annum, from that date to date of lodgment of the first instalment of £25 per cent. Any second, third, or final instalment not paid on its respecitve due date must also have interest to date of payment added.

The loan may be subscribed for either in the form of Bonds or Funded Stock at the option of the subscriber.

Bonds or Stock may be purchased in multiples of £10.

Subscribers for Funded Stock may have the interest on their Stock remitted to their Bank accounts in the country or outside the State free of exchange, but the interest on the Bonds will be payable in Sydney.

Forms of application for the loan may be obtained from the Registrar of Stock, The Treasury, Sydney; from the Branches of the Government Savings Bank of New South Wales throughout the State; and also at all Branches in the State of the Bank of New South Wales and the Commercial Banking Company of Sydney, Limited.

Deposits and instalments will be accepted at the Treasury, Sydney, or at any of the Branches of the Banks named.

Applications for the loan may be forwarded through members of recognised Stock Exchanges.

JOHN T. LANG,
Colonial Treasurer.

The Treasury,
Sydney, 1st October, 1920.

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VOL. XXXI. PART 12 DECEMBER 2, 1920.

*Agricultural Gazette of New South Wales.*

# Ploughing Experiments at Cowra and Nyngan.

C. McCAULEY and L. G. LITTLE, Assistant Experimentalists.

THESE experiments were commenced at Cowra in 1905, and at Nyngan in 1911, in each case upon virgin soil. In 1913, those at Cowra were concluded, as it was decided that the results were sufficiently definite to enable final deductions to be drawn. The Nyngan experiments are still being carried on.

The objects of the experiments were to determine over a series of years the comparative effects upon the resulting wheat crop of—

1. The continued use of the disc and of the mouldboard ploughs.
2. Ploughing at different depths with the above ploughs—
    (*a*) at 8 inches deep to represent deep ploughing.
    (*b*) at 6 inches deep to represent medium ploughing.
    (*c*) at 4 inches deep to represent shallow ploughing.
3. Subsoiling the deep ploughing (every second furrow) 2 to 3 inches below the plough depth.

A detailed account of the conditions under which the experiments were conducted at Cowra appears in Vol. XXII, February, 1911, of the *Gazette.*

A number of additional treatments were included in the Nyngan experiments, as being possibly advantageous under the dry conditions obtaining in that district; these comprise re-ploughing just prior to planting, and the use of an implement said to have been used by its inventor (Campbell) with great success in dry-farming in America. It consists of a number of flanged circular plates arranged on an axis, forming a roller, designed, as implied by its name (subsurface packer), to compress the subsurface at a depth of several inches, while leaving the surface loose.

Apart from the different methods of ploughing, and the treatments mentioned above, the general treatment of plots at both farms was uniform, and the system of farming adopted was that considered most suited to the district. Thus, at Cowra a two-course rotation (wheat and a fodder crop), and at Nyngan a three-course rotation (wheat, fodder crop, and bare fallow) were practised. This, of course, involved two separate areas for the experiments at Cowra and three separate areas at Nyngan. In all cases ploughing, sowing, feeding-off, etc., were carried out on the same or two successive days. Precautions were always taken to ensure that ridges and "clean out" furrows were located at the boundaries of plots.

**Cowra Experiments.**

The soil on which these experiments were carried out is of granitic origin, typical of a large area of the Central Western Slopes, and may be described as a loam overlying a clay subsoil at a depth of from 8 to 10 inches.

The costs per acre of ploughing with disc and mouldboard ploughs at different depths, and of subsoiling have been estimated as follows:—Disc ploughing, 4 inches, 6s.; disc ploughing, 6 inches, 7s.; disc ploughing, 8 inches, 8s.; mouldboard ploughing, 4 inches, 6s. 6d.; mouldboard ploughing, 6 inches, 7s. 6d.; mouldboard ploughing, 8 inches, 8s 6d.; sub-soiling, 10s.

These costs are rather difficult to arrive at, and vary slightly from year to year, according to the prices of fodder, &c., but they are sufficiently accurate to serve their purpose. Wheat is taken as being worth 7s. 6d. per bushel. Costs and yields on the disced 4 inches are taken as the standards of comparison.

The area of each plot was approximately one-third acre. In the following table is shown on a monetary basis the average of the results for the period 1905–13 (not including 1907, when a windstorm so mixed the stooks as to prevent the results being obtained, and 1909, when the crop was destroyed by a bush fire):—

| Treatments in order of merit. | Yield per acre, based on percentage yield. | | Increase due to Treatment. | | Value of Increase. | | Increased cost of Treatment. | | Net Gain. | | Net Loss. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | bus. | lb. | bus. | lb. | s. | d. | s. | d. | s. | d. | s. | d. |
| Mouldboard, 8 inches ... | 26 | 19 | 1 | 16 | 9 | 6 | 2 | 6 | 7 | 0 | ...... | |
| Disc 8 inches (average of 10 check plots) ... ... | 26 | 8 | 1 | 5 | 8 | 1 | 2 | 0 | 6 | 1 | ...... | |
| Mouldboard 8 inches and subsoiled ... ... ... | 27 | 23 | 2 | 20 | 17 | 6 | 12 | 6 | 5 | 0 | ...... | |
| Mouldboard, 4 inches ... | 25 | 43 | 0 | 40 | 5 | 0 | 0 | 6 | 4 | 6 | ...... | |
| Mouldboard, 6 inches .. | 25 | 42 | 0 | 39 | 4 | 10 | 1 | 6 | 3 | 4 | ..... | |
| Disc, 4 inches ... ... ... | 25 | 3 | ...... | | ...... | | ...... | | ...... | | .. ... | |
| *Disc, 6 inches ... ... | 24 | 45 | 0 | 18* | 2 | 3* | 1 | 0 | ...... | | 3 | 3 |
| Disc, 8 inches and subsoiled | 25 | 58 | 0 | 55 | 6 | 10 | 12 | 0 | ...... | | 5 | 2 |

* Decrease, not increase.

The difference between the highest and lowest of these results is less than 10 per cent., but this percentage should be allowed as a margin of possible error in such an experiment, so that the results as far as yield is concerned may be said to be fairly uniform. Slightly increased yields may be expected from deep ploughing when the system of farming followed is similar to that practised at Cowra Experiment Farm, but the above figures would probably not result if ploughing were delayed until just prior to planting, and even assuming that they would apply in the latter case, it must be remembered that the experiments take no account of the extra time involved in deep ploughing, beyond extra cost, whereas under the system practised on the average farm in the central west, time is so important a factor at ploughing time that it would scarcely pay to plough deeply for a problematical extra return of a few shillings per acre.

### Nyngan Experiments.

The west Bogan country, on which these experiments are being conducted, may be described as a medium loam, and is part of the "drift formation" which includes a large area of our western plains.

This account must only be accepted as a progress report, for, although the experiment has been carried on for nine years, and although the plots receive every time they are ploughed, the treatments which the experiment has been designed to test, yet, owing to the rotation practised, the wheat crop occupies the same site only every third year. A comparable result is therefore only obtained once in three years, and it may be that as time goes on, results which are now only slightly apparent will become intensified. If so, they should be noticeable on all three areas. The experiment will be continued for at least another nine years.

The costs per acre of the various operations at Nyngan have been estimated as follows:—Disc ploughing, 4 inches, 6s. 6d.; disc ploughing, 6 inches, 7s. 6d.; disc ploughing, 8 inches, 8s. 6d.; mouldboard ploughing, 4 inches, 7s.; mouldboard ploughing, 6 inches, 8s.; mouldboard ploughing 8 inches, 9s.; subsoiling, 13s. 6d.; reploughing, 6s.; sub-packing, 2s. Hay has been reckoned as worth £5 per ton.

The area of each plot was approximately one-seventh of an acre. The following table shows the average of the results for the five years 1911, 1912, 1913, 1916, and 1917. In the years 1914, 1918, and 1919, the crops were fed off as not being sufficiently promising to keep for hay:—

| Treatments in Order of Merit. | Yield per acre based on percentage yield. | Increase due to Treatment. | Value of Increase. | Increased Cost of Treatment. | Net Gain. | Net Loss. |
|---|---|---|---|---|---|---|
| | t. c. q. | c. q. | £ s. d. | £ s. d. | s. d. | £ s. d. |
| *Disc 6 inches, reploughed | 1 19 2 | 4 3 | 1 3 9 | 0 7 0 | 16 9 | ...... |
| *Disc 6 inches, sub-packed and reploughed ... ... | 1 19 2 | 4 3 | 1 3 9 | 0 9 0 | 14 9 | ...... |
| Mouldboard 4 inches ... | 1 15 3 | 1 0 | 0 5 0 | 0 0 6 | 4 6 | ...... |
| Disc 8 inches ... ... | 1 15 3 | 1 0 | 0 5 0 | 0 2 0 | 3 0 | ...... |
| Disc 4 ,, ... ... | 1 14 3 | ...... | ...... | ...... | ...... | ...... |
| Mouldboard 6 inches, sub-packed ... ... ... | 1 14 3 | Nil. | Nil. | 0 3 6 | ...... | 0 3 6 |
| Disc 6 inches, sub-packed, reploughed and sub-packed ... ... ... | 1 16 0 | 1 1 | 0 6 3 | 0 11 6 | ...... | 0 5 3 |
| Mouldboard 6 inches ... | 1 13 3 | 1 0† | 0 5 0† | 0 1 6 | ...... | 0 6 6 |
| Disc 6 inches, reploughed and sub-packed ... ... | 1 14 3 | Nil. | Nil. | 0 9 6 | ...... | 0 9 6 |
| Disc 6 inches, sub-packed .. | 1 13 1 | 1 2† | 0 7 6† | 0 3 0 | ...... | 0 10 6 |
| Mouldboard 8 inches, sub-soiled 10 inches ... ... | 1 15 2 | 0 3 | 0 3 9 | 0 16 0 | ...... | 0 12 3 |
| Mouldboard 8 inches ... | 1 12 2 | 2 1† | 0 11 3† | 0 2 6 | ...... | 0 13 9 |
| Mouldboard 6 inches, sub-packed, reploughed and sub-packed ... ... | 1 12 1 | 2 2† | 0 12 6† | 0 11 6 | .... | 1 4 0 |
| Mouldboard 4 inches, sub-soiled ... ... ... | 1 10 2 | 4 1† | 1 1 3† | 1 0 6 | ..... | 2 1 9 |

* The high average results for these two plots are due to two abnormally wet years (for Nyngan) in which reploughing produced twice the yield of the check plots. † Decrease, not increase.

From the above table it appears that under the soil and climatic conditions at Nyngan deep ploughing not only does not pay, but is really detrimental. This is explained by the fact that owing to its low humus content the soil is of poor water-holding capacity, and deep ploughing, by opening it up and further drying it out, aggravates this defect. The soil is also so deep that deep ploughing has the effect of allowing thorough percolation of rain into the lower layers, and much of this moisture is out of reach of the following crop until the soil has become compacted again.

Subsoiling is for these reasons unnecessary, while sub-surface packing has only given good results in isolated years.

## Request for March Flies.

An attempt is being made by the Director-General of Public Health to prepare a survey of the March flies of New South Wales, and he will be grateful to any *Agricultural Gazette* readers who will forward undamaged specimens, together with particulars as to the date of capture, the locality, the name of the animal or plant upon which the insect was captured, and other general information as to prevalence or otherwise at different seasons. A similar request was made on behalf of the Director-General several years ago, which resulted in much valuable information being obtained.

March flies, or horse flies as they are sometimes called, may be caught around horses and cattle. Specimens should be as little damaged as possible; if placed in a match-box with a little tissue-paper they may safely be sent through the post.

Specimens and information can be forwarded to Dr. E. W. Ferguson, office of the Director-General of Public Health, Macquarie-street, Sydney.

## Sea-weed as Manure.

Sea-weed is extensively used as manure in the Channel Islands and other parts of the world. It is usually cut off the rocks or gathered on the shore, and carted direct to the field where it is applied in the same manner as farmyard manure. Sometimes it is stacked in heaps and allowed to dry before use, or the stacks may be burnt and the ashes alone utilised.

As a general rule sea-weed is used for spreading over pasture land; it apparently imparts a salty taste to the pasture and increases its palatability to stock. When used on cultivation land it is seldom ploughed in, but is usually allowed to lie on the surface till the rain has washed most of its fertilising ingredients into the soil beneath, the turning under of the weed apparently making the soil too cold for early crops.

Sea-weed is frequently mixed with farmyard manure and applied to the land with that manure in winter and early spring.—A. J. Pinn, Inspector of Agriculture.

# The Saving of Seed Wheat.

A. H. E. McDONALD, Chief Inspector of Agriculture.

Owing to the severity of the drought in many of the wheat-growing districts last year, a considerable number of farmers were unable to harvest seed wheat to fill their requirements, and had to obtain seed from other districts, principally through the Rural Industries Board. The Board endeavoured, as far as possible, to obtain seed suitable for the different districts ; but, owing to the bulk of the seed having to be purchased in the Riverina, the principal variety was Federation, which, while suitable for the Riverina and western districts, is not altogether a satisfactory variety for the north-western districts, owing to its susceptibility to rust. It was also impossible to obtain sufficient seed of early-maturing varieties to fill the requirements of farmers in the dry districts, where these wheats are of special value—where, in fact, to grow wheat successfully under normal conditions, early-maturing varieties are indispensable.

Fortunately the season has been favourable, and, although rust has occurred to a slight extent, apparently—at the time of writing—no very serious damage has occurred among the wheat crops ; though farmers, especially in the north-west, have had a very anxious time in this respect, as they realised the position, and at times it appeared that there was very great danger of the crops being seriously damaged. The season has also been very favourable to later maturing varieties in dry districts, even as far west as Nyngan, and in consequence the shortage of early-maturing varieties has not resulted in the loss which might otherwise have occurred. It is fortunate that the season has been more favourable than usual, but such conditions cannot be expected to continue, and it is very necessary that farmers should immediately obtain those varieties which experience has shown to be most suitable for their particular conditions.

The Department has realised the necessity of assisting farmers to obtain suitable varieties, and early in the season made arrangements at the experiment farms in the wheat-growing areas to sow as large an area as possible of wheat, and to pay particular attention to those varieties which would be urgently required. Further than this, it was arranged with private growers to harvest as much for seed wheat as possible, and in order to ensure that the seed should be reasonably pure and true to variety, arrangements have been made for officers of the Department to inspect these crops. These steps will ensuro that a large quantity of suitable seed will be available, and purchasers can be reasonably sure that they will be able to obtain the varieties which they require.

It is not proposed that the Department shall purchase seed from those farmers whose crops are inspected for seed purposes, but through the *Agricultural Gazette* it will give publicity to the names of farmers whose crops are sufficiently pure to warrant recommendation, with a view to bringing them into communication with those farmers who require seed.

It has been arranged that all farmers who wish to purchase seed from the experiment farms will be supplied, the quantity supplied to each farmer being restricted if necestary so as to ensure a proper distribution. It is impossible for the experiment farms to supply all the seed wheat which is required, and the Department hopes that the farmers will use the seed obtained from the experiment farms to raise their own seed. While, therefore, during the coming season it may be necessary to continue the use, to some extent, of seed from the crops now growing on farmers' own properties, in the following season the conditions will have reverted to normal and a plentiful supply of suitable varieties will be available.

In view of the importance of securing suitable varieties, farmers are strongly recommended immediately to take steps to secure seed requirements for the coming season. The supply of seed will be limited, but every farmer should, at any rate, secure a few bushels from which he will be able next year to harvest sufficient seed to fill the whole of his requirements for the following season.

One of the worst features of drought is that it often causes the loss of valuable varieties, and a number of years elapse before normal conditions return. Fortunately, the Department has realised the importance of conserving these varieties, and the steps already taken will go very far towards minimising such losses.

## The Farmers' Bulletins.

As stated last month, it has become necessary to impose a small charge for the Farmers' Bulletins issued by the Department of Agriculture. Remittances should be forwarded to the Government Printer, Phillip-street, Sydney. Following are a few of the bulletins available :—

| | | | Price. |
|---|---|---|---|
| No. | 36. | Sorghum ... ... ... ... ... | 6d. |
| ,, | 48 | Book-keeping for Farmers ... ... ... | 6d. |
| ,, | 63. | Orchard Nursery Work: Budding and Grafting ... ... ... ... ... | 6d. |
| ,, | 88. | Fruit Preserving: Canning, Bottling, and Jam-making ... ... ... ... ... | 9d. |
| ,, | 90. | Citrus Culture ... ... ... ... ... | 1s. |
| ,, | 92. | Apple and Pear Growing ... ... ... | 9d. |
| ,, | 119. | The Peanut ... ... ... ... ... | 9d. |
| ,, | 121. | Water on the Farm ... ... ... ... | 9d. |
| ,, | 124. | Land Clearing by Explosives ... ... | 6d. |
| ,, | 126. | Sudan Grass ... ... ... ... ... | 6d. |
| ,, | 129. | The Beginner in Bee Culture ... ... | 6d. |
| ,, | 130. | The Packing of Fruit ... ... ... ... | 9d. |
| ,, | 132. | Sheep and Wool for Farmers (Part 2—Cross-breeding for Wool and Mutton) ... ... | 9d. |

Postage, one penny extra.

# Some Fundamental Principles of Co-operation.

C. C. CRANE, B.A., Organising Inspector of the Agricultural Bureau.

ALTHOUGH co-operative ventures vary greatly in detail and organisation, practically all have been raised on a foundation of co-operative principles that are generally accepted. Many of the unsuccessful co-operative undertakings can trace the root of failure to some departure from co-operative principles. The principles may be briefly enunciated in a few paragraphs.

Co-operative organisation can only be successfully undertaken when the conditions it is designed to remedy are such that the need for improvement is clearly evident to all whom the conditions affect. In short, *necessity must be the mother of co-operation.*

When prices are demonstrably too high so far as consumers are concerned, when undue profits can be definitely pointed out, when producers' receipts fall below actual cost of production, when existing methods are costly and harmful to the prosperity of an industry, then perhaps co-operators may hope to organise with definite objectives and good probabilities of success.

Every single step in the organisation must be formal and regular. Each step must stand the test of practical application, and must be able to show (*a*) striking improvements from the time of its practical adoption, and (*b*) good prospects for further improvement as it develops. The time must be ripe and results must be speedily apparent; otherwise the organisation will die from inertia and succumb to the attacks of competitors.

There must be sufficient visible support to ensure at least the minimum amount of business, below which the venture cannot be economically conducted. There must be a sufficient volume of business to reduce the overhead costs and charges to a minimum, so that the venture can work more economically and efficiently than the organisation it was designed to displace.

The loyalty of individual members and mutual confidence in each other are of paramount importance. It is perhaps the most outstanding feature necessary to success. Every member must be made to feel his importance as a cog in the machinery, and steps must be taken to maintain his interest and keep him in touch with the whole detail and scope of the undertaking. He must realise (*a*) the necessity for the movement; (*b*) the improvements already effected; (*c*) the improvements likely to accrue; and (*d*) the probable results of abandoning the venture. In many successful co-operative ventures, binding agreements have been found necessary to guarantee absolutely the loyalty of individual members as though it were the life blood of the movement.

The organisation must be composed only of persons whose interests are similar and directly involved. In a co-operative store, as all consumers are involved the membership must be open to all, irrespective of occupation. In a producers' co-operation only those growers who are concerned as actual growers should be admitted to membership. Many successful co-operative marketing exchanges have found it necessary to limit membership to quite restricted areas to secure (*a*) uniformity of produce; (*b*) mutual acquaintance and confidence of members; and (*c*) simplicity of organisation.

Definite provision must be made for financing the business of the organisation. A minimum should be fixed which will not exclude possibly earnest members. Shares in a growers' concern should be taken in proportion to bearing acres or volume of probable business. Capitalisation is of first importance, and a means of obtaining necessary capital must be adopted as a first principle. When necessary a beginning will have to be on a small scale. The society must learn to walk before it can run. Development will depend on capitalisation.

If sufficient capital cannot be raised by subscription for shares, a loan will be necessary and sufficient security will have to be forthcoming. A shortage of capital may induce the society to dispose of shares to other than those directly interested, but in a producers' co-operation the sale of stock must always be limited to the grower of the product marketed, stock must be transferable only to growers, and the amount of stock held by any individual must be limited.

Benefits accruing from membership must be distributed among members in proportion to the amount of business effected, and not in proportion to the amount of share capital subscribed by each member.

Whereas in a producers' co-operation, subscriptions to capital should be in proportion to the bearing acreage of the member, the returns must be in proportion to the actual business effected; this is essential to quality and uniformity.

A maximum rate of interest on capital should be determined to prevent (*a*) fluctuation in price of shares; (*b*) speculation in shares; and (*c*) capitalisation from a profit-making point of view in lieu of the non-profit co-operative ideal.

It makes very little difference whether voting power is based on the principle of "one-man-one-vote," or whether voting power is in proportion to (*a*) capital invested, or (*b*) business effected, for the limit placed on the holding of any individual and the restriction of membership to people with similar interests will secure sufficiently democratic control. An essential feature of the Rochdale pioneer system was one-man-one-vote. and while in a co-operative store that principle would perhaps be wiser, in a producers' concern voting power in proportion either to acreage or to business, in accordance with the basis of share distribution, should prove satisfactory. But wherever the one-man-one-vote principle is departed from, sufficient guarantees must exist to prevent (*a*) too many shares coming into the possession of one man; and (*b*) accumulations of shares passing into the hands of possible opponents of the scheme.

The individual is the basis of the local co-operative society, which itself is a unit in a co-operative union, federation, or wholesale exchange. Individual societies affiliated with such a union produce a greater co-operative zeal and enthusiasm than where individuals are just members of some big co-operative enterprise, or where the local co-operative society is but a branch of a bigger concern.

Every local society, therefore, should preserve its identity and have necessary machinery thoroughly to represent its interests in the central organisation.

The local unit will require to organise itself, for as it is to retain its own individuality it will need its local enthusiasts and directors. Therefore local organisation is generally to be preferred to the system, which nevertheless frequently succeeds admirably, of securing the services of a professional organiser. Each organisation will need administrative ability and business knowledge, and it is the poorest form of economy to engage a cheap manager. A manager will be absolutely necessary, for his full time will be required. As local conditions are of tremendous importance in designing and administering the policy, the conception of the local society as a unit affiliated with a central union is of the utmost importance.

In co-operative marketing, expenses should be counted on the basis of quantity not of price. It costs as much, often more, to market poor quality produce, and as returns from the co-operative society are made, not in proportion to the actual cash receipts for produce handled, but in proportion to the quantity of produce handled, the tendency will always be to improve the quality of the product.

## A Germination Standard for Lucerne Seed.

The suggestion has lately been made that a germination standard should be fixed in respect of lucerne seed intended for export, and a standard of 90 per cent. has been mentioned. It was pointed out at a recent meeting that certain seedsmen guarantee a germination of over 95 per cent.

Such standards are admirable, but it is doubtful if in actual practice it could be maintained, and if challenged it would probably be found that the germination would very seldom indeed reach 95 per cent. Of all the samples tested in the seed-testing laboratory at the Botanic Gardens, an average of only about 80 per cent. has been obtained; in one case as much as 98 per cent. of a sample germinated, and in others as little as 70 per cent. This wide divergence is due to the number of hard seeds present, the proportion varying considerably according to habit and conditions. For this reason the United States Department of Agriculture is careful to set its standards at 85 to 90 per cent., and this includes a third to a half of hard seeds possessing slow germinating qualities. Under the circumstances New South Wales growers are not in a position to guarantee a standard of over 80 per cent., excluding hard seeds. If a standard of 90 per cent. were fixed, it should be with a clear reservation that half the hard seeds present should germinate, given sufficient time.—E. Breakwell, Agrostologist.

# Sheep and Wool for Farmers.

## CROSS-BREEDING EXPERIMENTS.

[Concluded from page 770.]

## Results of Lamb-raising Trials.

J. WRENFORD MATHEWS.

### SALEYARDS AND FARM WEIGHTS.

THROUGHOUT the continuance of the trials, the lambs were weighed at the farms just prior to despatch, and again immediately on arrival at the Homebush yards, receiving neither food nor water in the meantime.

In the majority of cases the fourth monthly weighing was the final one, but there were instances where some time elapsed between the fourth weighing and the despatch of the lambs, and, in these cases, the lambs were passed over the scales again. This accounts for the slight increases in weight shown in the table published last month giving the monthly weighings, and the one that now indicates the final weighings, as well as the loss of weight in transit, and the values realised for the different crosses.

Wagga Experiment Farm Averages—1913–1918 (inclusive).

| Cross. | No. | Weights. | | Average loss in transit. | Price realised. |
|---|---|---|---|---|---|
| | | At farm. | At saleyards | | |
| | | lb. oz. | lb. oz. | lb. oz. | s. d. |
| $D_1L_1M$ | 62 | 72 7 | 67 2 | 5 5 | 18 4 |
| $D_1L_2M$ | 84 | 69 6 | 65 1 | 4 5 | 17 11 |
| $D_1L_3M$ | 124 | 72 8 | 67 0 | 5 8 | 19 2 |
| $D_2L_1M$ | 55 | 71 7 | 66 1 | 5 5 | 18 1 |
| $D_2L_2M$ | 79 | 69 13 | 64 9 | 5 4 | 18 9 |
| $D_2L_3M$ | 135 | 74 9 | 68 11 | 5 14 | 19 11 |
| $D_5L_1M$ | 65 | 77 5 | 73 0 | 4 5 | 21 4 |
| $D_5L_2M$ | 67 | 78 8 | 74 2 | 4 4 | 21 2 |
| $D_5L_3M$ | 114 | 81 10 | 76 2 | 5 8 | 22 0 |

To remove any false impression that the lambs comprised picked lots, it may be stated that the various consignments included practically the whole of each year's drop. The only ones held back were a few that were dropped late and that were obviously too backward in development to enable fair comparisons to be made. As indicated by the previous tables, the lambing period occupied about six weeks, so that there was a difference of about that length of time between the first and last lamb dropped.

The lambing was fairly evenly distributed over the period among all strains, so that no cross was placed at either advantage or disadvantage in this respect. The results coincide with the returns furnished in the previous

monthly tables. The Dorset Horn shows a substantial increase from practically all strains of ewes. The Border Leicester x Merino ewe maintains its advantage, and the Leicester x Merino occupies third place in all groups, except in the case of the mating with the Dorset Horn.

Taking the results from the three strains of ewes by the three breeds of rams, the results show the South Down crossbred lambs averaged 71 lb. 12 oz., the Shropshires 72 lb. 9 oz., and the Dorset Horns 79 lb. 10 oz. in the aggregate.

Similarly we find the different strains of ewes when grouped together yielded lambs averaging respectively Lincoln x Merino, 73 lb. 14 oz.; the Leicester x Merino, 72 lb. 3 oz.; and the Border Leicester x Merino, 76 lb. 6 oz.

When worked out for the full period, the loss of weight in transit for all crosses represents 6·8 per cent. of the total live weight on the average. It would be extremely difficult to say exactly what proportion of this loss was really tissue. It was the practice in the majority of the consignments, when the lambs were taken off the pastures, to yard the lambs for a few hours before weighing. This period, however, was not sufficient to enable the full contents of the stomachs and intestines to be emptied. So that a certain percentage of the loss in weight would be represented by excreta voided while on the journey.

The figures, however, are convincing enough to reveal that a considerable percentage of waste takes place during transit. Obviously the best facilities that can be afforded for transport, or, better still, killing and freezing near the farm, are the most practical measures that can be adopted to reduce the loss.

### The Prices Realised.

The next point that calls for comment is the prices realised. Looking at these returns, as before, first for the rams and then for the ewes in their combined groups, we find the lambs by South Down rams realised 18s. 7d., those by Shropshire rams 19s. 11d., and those by Dorset Horn rams 21s. 7d. On the side of the ewes, the lambs from Lincoln x Merino ewes realised 19s. 3d., those from Leicester x Merino ewes 19s. 1d., and those from Border Leicester x Merino ewes, 20s. 3d.

Cowra Experiment Farm Averages—1913–19 (inclusive).

| Cross. | No. | Weights. At farm. | | Weights. At saleyards. | | Average loss in transit. | | Price realised. | |
|---|---|---|---|---|---|---|---|---|---|
| | | lb. | oz. | lb. | oz. | lb. | oz. | s. | d. |
| $D_1L_1M$ | 91 | 72 | 0 | 66 | 2 | 5 | 14 | 18 | 8 |
| $D_1L_2M$ | 89 | 75 | 4 | 68 | 12 | 6 | 8 | 18 | 10 |
| $D_1L_3M$ | 79 | 75 | 2 | 68 | 15 | 6 | 3 | 18 | 8 |
| $D_2L_1M$ | 104 | 72 | 6 | 65 | 8 | 6 | 14 | 19 | 3 |
| $D_2L_2M$ | 101 | 73 | 2 | 66 | 11 | 6 | 7 | 18 | 4 |
| $D_2L_3M$ | 88 | 76 | 10 | 70 | 5 | 6 | 5 | 20 | 0 |
| $D_5L_1M$ | 94 | 75 | 6 | 69 | 10 | 5 | 12 | 20 | 8 |
| $D_5L_2M$ | 113 | 76 | 1 | 68 | 13 | 7 | 4 | 20 | 7 |
| $D_5L_3M$ | 98 | 78 | 3 | 72 | 9 | 5 | 10 | 22 | 0 |

The results again are fairly consistent. Taking the essential figures as an indication of the merits of the competing strains, the Dorset Horn again asserts its superiorty on the score of body weight over the other two breeds, and among the ewes the Border Leicester x Merino is again to the fore. The averages are:—Rams—South Down, 73 lb. 5 oz.; Shropshire, 73 lb. 14 oz.; Dorset Horn, 76 lb. 8 oz. Ewes—Lincoln x Merino, 73 lb. 3 oz.; Leicester x Merino, 74 lb. 8 oz.; Border Leicester x Merino, 76 lb. 12 oz.

The loss of weight in transit represents in this case 8·4 per cent. of the total live weight. It is difficult to account for this, as the distance from Wagga to the saleyards is about 100 miles greater than from Cowra, and the time spent in the trucks would be longer from the former than from the latter. As far as possible the same methods were employed in the weighing, though it cannot be stated whether the time allowed between the removal of the lambs from the pasture and actual weighing was the same.

Reviewing the values in order as in the previous instances, we find on the average of all ewes the South Down strain gave a monetary return of 18s. 9d., the Shropshire 19s. 1d., and the Dorset Horn 21s. The figures for the ewes are:—Lincoln x Merino, 19s. 7d.; Leicester x Merino, 19s. 4d.; and Border Leicester x Merino, 20s. 4d.

Bathurst Experiment Farm Averages—1913–19 (inclusive).

| Cross. | No. | Weights. | | Average loss in transit. | Price realised. |
|---|---|---|---|---|---|
| | | At farm. | At saleyards. | | |
| | | lb. oz. | lb. oz. | lb. oz. | s. d. |
| $D_1L_1M$ | 62 | 70 6 | 66 11 | 3 10 | 20 4 |
| $D_1L_2M$ | 65 | 75 14 | 67 7 | 8 7 | 20 8 |
| $D_1L_3M$ | 73 | 74 6 | 69 2 | 5 4 | 22 3 |
| $D_2L_1M$ | 67 | 70 12 | 65 2 | 5 10 | 18 11 |
| $D_2L_2M$ | 67 | 73 11 | 67 8 | 6 3 | 21 3 |
| $D_2L_3M$ | 57 | 73 1 | 67 7 | 5 10 | 19 10 |
| $D_5L_1M$ | 61 | 77 12 | 71 4 | 6 8 | 20 10 |
| $D_5L_2M$ | 66 | 77 7 | 71 12 | 5 11 | 21 6 |
| $D_5L_3M$ | 64 | 77 10 | 72 4 | 5 6 | 21 4 |

Again the Dorset Horn ram is on top on the score of body weight, though the results here are more uniform, the margins on the whole not being so great. The Leicester x Merino group of ewes disputes pride of place with the Border Leicester x Merino, though the difference only amounts to a few ounces. The relative positions of the rams are as follow:—South Down, 73 lb. 10 oz.; Shropshire, 72 lb. 8 oz.; Dorset Horn, 77 lb. 10 oz. Ewes—Lincoln x Merino, 72 lb. 14 oz.; Leicester x Merino, 75 lb. 12 oz.; and Border Leicester x Merino, 75 lb. 2 oz.

The loss of weight in transit amounts to 7·6 per cent., so that we are just as far as ever from arriving at conclusions on this point. Apparently this is governed by circumstances, and, beyond recording the particulars, we refrain from making definite assertions as to what appears to be an anomaly.

The monetary return for the different breeds of rams is as follows :—South Down, 21s. 7d. ; Shropshire, 19s. 11d. ; Dorset Horn, 21s. 3d. For the different ewes the figures are :—Lincoln x Merino, 20s. ; Leicester x Merino, 21s. 2d. ; and Border Leicester x Merino, 23s. 6d. This is the only case in which the Dorset Horn has been ousted from first place, but it might be noted that the Border Leicester x Merino ewe affirms its position, showing an advantage practically of 3s. 6d. over the Lincoln x Merino, and 2s. 4d. over the Leicester x Merino.

### Final and Combined Return.

The trials were inaugurated with the object in the first place to see which breed or combination of breeds gave the best monetary return, and then, further, to observe whether any wide divergence between the strains occurred in the different districts in which the investigations were conducted.

As in the case of the longwools, only fair average specimens of each of the competing strains of the shortwool breeds were employed. As near as ordinary sight would permit, a uniform standard of breed was selected at each farm. The results may, therefore, be considered thoroughly reliable, and a true exposition of the capabilities of the breeds named, so far as the purposes for which they have been tried and the districts are concerned. It is with the object of showing the results from the different districts that the records from the three farms have been tabulated separately.

TABLE III.—Combined Averages of body weights, loss of weight in transit, and prices realised.

| Cross. | No. | Weights. | | | | Average loss in transit. | | Price realised. | |
|---|---|---|---|---|---|---|---|---|---|
| | | At farm. | | At saleyards. | | | | | |
| | | lb. | oz. | lb | oz. | lb. | oz. | s. | d. |
| $D_1L_1M$ | 215 | 71 | 9 | 66 | 9 | 5 | 0 | 19 | 0 |
| $D_1L_2M$ | 238 | 72 | 15 | 67 | 1 | 5 | 14 | 19 | 0 |
| $D_1L_3M$ | 276 | 75 | 12 | 68 | 8 | 5 | 4 | 19 | 1 |
| $D_2L_1M$ | 226 | 71 | 8 | 65 | 9 | 5 | 15 | 18 | 10 |
| $D_2L_2M$ | 237 | 72 | 2 | 66 | 3 | 5 | 15 | 19 | 10 |
| $D_2L_3M$ | 280 | 74 | 14 | 68 | 15 | 5 | 15 | 19 | 9 |
| $D_5L_1M$ | 220 | 76 | 10 | 71 | 1 | 5 | 9 | 20 | 11 |
| $D_5L_2M$ | 246 | 77 | 1 | 71 | 0 | 6 | 1 | 21 | 0 |
| $D_5L_3M$ | 276 | 79 | 8 | 73 | 15 | 5 | 9 | 21 | 10 |

It is at once evident from these figures that the Dorset Horn on the Border Leicester x Merino ewe gives a lamb that furnishes the best monetary return, and among the other groups the Border Leicester x Merino ewe

gives further evidence of supplying the heaviest lamb. Scrutinising these figures more closely, as in previous instances, we find the breeds occupying relatively the following positions :—

| Weight of lambs by— | | Weight of lambs from— | |
|---|---|---|---|
| | lb. oz. | | lb. oz. |
| South Down ... | 72 13 | Lincoln x Merino ... ... | 73 3 |
| Shropshire ... | 72 13 | Leicester x Merino ... ... | 74 0 |
| Dorset Horn ... | 77 13 | Border Leicester x Merino ... | 75 14 |

The figures require but little comment. The outstanding feature has been the consistency of the results. The Dorset Horn has headed the list among rams, and the Border Leicester x Merino has occupied a similar place among the competing strains of ewes.

With regard to the rams, the South Downs and Shropshires come out about equal, but among the ewes the Leicester shows a slight advantage over the Lincoln in accordance with its earlier maturing habit.

Putting all farms together, and taking into consideration the distances the sheep had to travel from each place, the loss of weight in transit amounted to 7·6 per cent. on the whole.

The next point for consideration is to what extent the body weights can be reconciled with the prices realised for the mutton. In other words, we have to consider whether the lighter weight carcase of the South Down is worth more on a basis of so much per lb. than the heavier carcases by the Dorset Horn, and also whether the extra weight of fleece produced by the Lincoln cross ewe more than balances the difference in the extra body weight of the lambs dropped by the Border Leicester cross.

| Lambs from all groups of ewes by— | Prices realised. | Lambs from all breeds of rams from individual ewe strains. | Prices Realised. |
|---|---|---|---|
| | s. d. | | s. d. |
| South Down ... | 19 0 | Lincoln x Merino ... ... | 19 7 |
| Shropshire ... | 19 4 | Leicester x Merino ... .. | 19 10 |
| Dorset Horn ... | 21 4 | Border Leicester x Merino ... | 20 2 |

We may recall the fact that the previous articles as to the results from the first cross ewes showed little difference in the aggregate values of wool and mutton between the Lincoln and Border Leicester cross ewes, while the Leicester cross showed consistently behind the other two; looking at the results in a general way, therefore, the Border Leicester x Merino maintains its superiority throughout.

From the returns before us it is possible to ascertain the relative values paid on a basis of so much per lb. for the mutton of the various crosses. In this connection we have not distinguished between the different strains of ewes, but have lumped in each case all three together and merely given the figures against each strain of ram. It might further be mentioned that the sheep were offered for public competition, and as they were bought at so

much per head the values have been calculated on the basis of the average live weight recorded at the saleyards. The following are the particulars :—

| Breed of ram. | No. | Average weight in Sydney. | Average price per lb. |
|---|---|---|---|
| | | lb. oz. | |
| $D_1$ | 729 | 67 7 | 4·7d. |
| $D_2$ | 743 | 66 8 | 4·5d. |
| $D_5$ | 742 | 72 1 | 4·5d. |

The South Down crosses were considered by salesmen to furnish the best quality of mutton, and on the whole to supply the most uniform shape and compact carcase. The Dorset Horn, on the whole, furnished the heavier carcase, but slightly less shapely. The Shropshire crosses on the other hand were slightly longer than the South Down, though fairly compact; but on analysis of these figures we cannot resist one conclusion, namely, that the weight of carcase is the prime factor in attesting the value of the different crosses.

The lambs were offered in the wool, and indeed from previous records taken it was deduced that it is not profitable to shear lambs intended for early sale. The comparatively small return of wool which they yield scarcely repays for the outlay. Besides, lambs raised for export should be handled as little as possible. The knocking about which they receive in the yards, and the shearing itself (if they are shorn) is sufficient to so lower their condition as to render many unfit for being classified as first grade. Moreover, the amount of wool left on the pelt is rendered practically valueless except to those manufacturers using very short wool. Separated from the staple of which it originally formed part, it could be classed as little better than "noil," but left on the skin the full length of the staple is obtained, and the wool may be possibly used for combing purposes after the skins have gone through the process of fellmongering. Furthermore, the value of the skin is of only very minor importance as compared with the value of the carcase. In raising lambs for export the whole attention should be concentrated on the development of the carcase. Obviously the lamb at five months has not had sufficient time to develop the skin in the same proportion as the body, and as the export lamb trade develops the wool question will sink into insignificance as contrasted with the value of the flesh.

## Summary.

We may thus present the following conclusions :—

(1) *The possibilities of lamb-raising.*—New South Wales offers almost unbounded possibilities for the extension of the lamb-raising industry in districts where sheep-raising can be carried on in conjunction with wheat-growing.

(2) *The desirable type of lamb.*—All lambs fit for export should not weigh less than 66 lb. nor more than 80 lb. live weight. This will allow for a carcase weighing between about 33 and 40 lb. dressed weight, which will be classed as first grade according to quality, shape, and condition.

(3) *The most suitable ewes.*—To attain this standard it is necessary to depart from the pure Merino ewe, and to use in preference a longwool crossbred ewe; of those tried the Border Leicester x Merino ewe gave, on the whole, the best returns.

(4) *The breed of ram.*—To secure the ideal lamb carcase, the shortwool or Down ram should be used in preference to longwools. The South Down furnished the most shapely carcase, but the Dorset Horn gave consistently the best returns.

(5) *The period of mating.*—To procure a satisfactory increase the ewes should be mated about Christmas, and the rams allowed to run with them until about the middle of February.

(6) *To secure a good lambing.*—To ensure as many ewes as possible getting in lamb the rams should be yarded with the ewes over night during the mating period.

(7) *Lambing and weaning seasons.*—The lambs should be dropped as early as the mating period will permit in the autumn, and marketed at the expiration of the lactation period in the spring.

(8) *The food supply.*—In order that the lambs shall not suffer a check they, along with their mothers, should be supplied with good succulent feed from the the time they are dropped until they are despatched for market.

(9) *The shearing of the lambs.*—Lambs intended for export should not be shorn. They should be handled as little as possible, and given every care so as to avoid knocking about with consequent damage to the carcase.

(10) *Breeding propensities.*—In the Department's experiments there was little to choose between the three breeds named on the score of virility, but the lambs by the Dorset Horn rams appeared to suffer a check and recover again more readily than those by either of the other breeds.

(11) *The prolificacy of the ewe.*—All three groups of ewes appeared fairly ready breeders when mated at the correct time, but a slightly better increase was obtained by the Department from the Border Leicester x Merino cross.

(12) *Loss of weight in transit.*—The average loss of weight in transit from farm to Homebush amounted to 7·6 per cent. of the live weight, but those figures were taken when the lambs had been taken off the pasture and therefore did not represent the actual starved weight.

(13) *The value of the mutton.*—Little difference was found between the mutton value of the different crosses, and weight of carcase appears to be the prime factor in distinguishing between the monetary value of the competing strains.

The thanks of the Department are due to Messrs. Badgery Bros. who assisted throughout in the weighing of the various consignments and arrangement of the sales. It desires also to place on record its acknowledgement of the support and assistance rendered by the various representatives of the different exporting firms in the work of assessing the value of the different crosses from time to time as they were offered.

South Down x Lincoln-Merino Lambs.

South Down x Leicester-Merino Lambs.

South Down x Border Leicester-Merino Lambs.

Shropshire x Lincoln–Merino Lambs.

Shropshire x Leicester–Merino Lambs.

Shropshire x Border Leicester–Merino Lambs.

Dorset Horn x Lincoln-Merino Lambs.

Dorset Horn x Leicester-Merino Lambs.

Dorset Horn x Border Leicester-Merino Lambs.

**Malabar Cane at Pimlico.**

The crop (plant cane) was estimated to yield 50 tons per acre.

# The Culture of Sugar Cane in New South Wales.

[Continued from page 780.]

A. H. HAYWOOD, Manager, Wollongbar Experiment Farm.

## The Preparation of the Land.

DEEP and thorough working of the soil is an essential preliminary to the planting of sugar cane. Not alone is this necessary because the plant is of deep-rooting habit, but a plant with such a strong vegetative growth and a capacity for producing in a few years two or three crops, often totalling over 100 tons, must in the very nature of things be provided with ample soil in friable, cultivated condition, in which the roots can forage for plant-food. The first ploughing should therefore be not less than 8 or 10 inches deep, and if the subsoil is stiff, subsoiling should be effected with a plough designed for the purpose, or with a plough of ordinary construction from which the mouldboard has been removed. If the land is not too well drained, care must be taken not to bring sour soil to the surface.

This initial ploughing is best done late in the autumn or early enough in the winter to allow a fallow period of some four or five months before planting in September. The effect is twofold. It exposes the soil to atmospheric action, allowing sun, frost, and rain to ameliorate the physical condition, and affording the soil bacteria opportunity to elaborate plenty of plant-food in readiness to maintain vigorous plant life later on.

A second ploughing in the spring is necessary further to pulverise the soil and ensure a loose friable condition, and this must be followed by work with surface-working implements that will prepare a suitable seed-bed. A third ploughing is preferred by some farmers, and no doubt is necessary in stiffer soils. The cane plant is a particularly delicate one in its early stages, and if it is to earn the maximum of profit for the farmer, it must have thoroughly favourable soil conditions. No amount of after-cultivation will overcome careless preparation of the seed-bed, and when it is considered that the plant is to last for four to six years, and to carry two or three heavy crops of top-growth, it is apparent that thoroughness is quite worth while. It can be added with justice that for the most part the New South Wales grower understands and appreciates this, and lays a good foundation in this respect.

## Planting the Crop.

The methods of planting the sugar cane crop necessarily differ with the conditions. A great many growers in this State prefer to plant on the square so that intercultivation can be carried out both ways, and two conditions favour them in doing so—the nature of the soil and the varieties they grow. On the stony ridges of the Cudgen, drill-planting is the only thing

to be thought of. Of varieties, one like Innes 131—erect in habit and a poor stooler—requires comparatively little room. Usually the seed is planted 18 to 24 inches apart in running drills that are 5 feet from one another.

Square planting is, however, much the better system. It affords the roots more space and permits of thorough cultivation both ways while the crop is growing, and that by medium of horse implements at a minimum of expense throughout the life of the crop. It is one of the reasons advanced by advocates of the square system that the ratoon crops are heavier by reason of the intercultivation that it makes possible.

Some variation is found, of course, in respect to the distances between the plants, from 4 feet 3 inches square to 5 feet being variously used. As before, this depends somewhat upon the soil and the variety, but 4 feet 6 inches may be accepted as a useful medium for average conditions.

It is a prime doctrine of cane-growing that you should "plant deep, but cover lightly." The apparent contradiction is explained if it is added that a furrow 8 inches deep is opened in the prepared soil, the plant or set is put at the bottom of the furrow, and 2 or 3 inches of soil drawn in, after-cultivation being allowed to fill in the furrow as the plant grows. Early in the season the covering may be on the lighter side, but at no time should it be heavier than indicated.

The opening of the furrow is generally effected with the mouldboard plough, which is used twice (once in each direction), but some farmers use a double mouldboard implement for the purpose.

The dropping of the sets is usually done by hand, farmers generally preferring that method, on the ground that they can place the sets according to their own desires, and then cover them lightly with a hoe.

Some importance is attached to the position in which the sets are placed; it would appear reasonable to expect that with one eye on each side as the set lies in the drill the germination would be quicker than where a shoot had to make its way from underneath the set to the surface, but there are many who hold it a matter of indifference, averring that the plant will come through quite as quick under the latter as the former condition.

"Get it up quick; that is the main thing," said one farmer, thus tersely expressing the general opinion that an early and vigorous start is of first importance.

### Good Drainage an Essential.

Where the ground is apt to be waterlogged or flooded from time to time, some success has been obtained by throwing up ridges and planting the sets along the tops, so that the roots strike downwards to the water, and follow flood-waters down as they subside. There is on all three rivers, land that will no longer carry cane for the reason that it requires systematic drainage, and to this aspect of matters many farmers could address themselves with profit. How large a part it plays in cane-growing in some countries may be illustrated by the fact that in Louisiana thousands of acres that cannot be drained into the rivers are made available for cane by huge pumping plants.

"Improvement will begin with the observance of two things," said the Colonial Sugar Refining Company's officers at Broadwater mill in a conversation lately. "The first is the selection of sets from disease-free canes, and the second is good drainage." These gentlemen are in constant contact with the necessity for good drainage, for on the Richmond some of the very best land is the poorest drained and therefore lightest in yield. There are farmers with whom drainage should be the first consideration of all, but with whom it still occupies a quite indifferent place.

### Filling up the Misses.

Misses are not unknown in the springing cane-field, and growers find it well to strike a few sets elsewhere than in the crop, in order that the gaps may be filled up with plants of about the same age. Needless to say, the conditions in such cases should as closely resemble those of the crop as possible. Where drill planting is adopted it is a good practice to plant single sets in five rows in the ordinary way, and in the sixth to plant double the number of sets. In this way any plants that have failed in any of the rows can be filled in from the sixth row, where the plants will be of uniform growth, and will not have to be brought from a nursery where the conditions may have been very different. The sixth row can be thinned out as required when the misses have been filled up.

In his work in Hawaii, Dr. Cobb regarded failures in the planting as of considerable significance. He argued that they indicated either unhealthiness in the sets or unfavourable conditions in the soil, and as disease was sure to be one of the latter, he advised that where sets had failed the soil should again be deeply and well worked, and new soil brought in if possible, and that care should be taken to remove altogether the dead or dying set before the new one was planted.

### The Seed to Use.

The selection of the sets has a most important influence upon the plant. Vigour, stooling habit and freedom from disease, and, of course, adhesion to varietal characters are elementary considerations; others might be mentioned, but if due regard were paid to these there is little room for doubt that sugar cane would be more attractive than it is ever likely to be under present conditions. Here again the experienced North Coast grower gaily acclaims the soundest principles and as gaily goes forward on his own happy-go-lucky lines. One-year-old cane of first ratoon crop, or at the least twelve months' cane from a plant crop, is no doubt universally used, and rightly so, for there lies healthy vigour and activity. Every grower knows, too, that while the butt shoots provide hardier and stronger plants, they also make slow-growing ones; similarly every grower knows that the top shoots provide the quickest growth, but the tenderest—even the weakest plants. Thus enclosed, the grower proclaims the advisability of using only the middle portion of the cane—but then cane is worth £2 per ton and perhaps a bonus to boot, and what thrifty grower would think of sacrificing half a ton per acre of good cane for the doubtful advantage

of a better crop two years hence? Perish the thought! Use the whole length; it makes little difference after all! And so the crop that might be better than its progenitor, and that might become the progenitor of better still, is sacrificed once more, and the grower remains in the sphere to which his methods condemn him.

If anyone considers we exaggerate the situation let him think about it once more. Let him ask himself how much serious selection he practices in relation to freedom from disease. Obviously debilitated and diseased plants are no doubt avoided, but there is reason to fear that even this is not consistently done. What is wanted is a knowledge of the earlier indications of the presence of disease—in other words, what especially to avoid in this connection.

The soundness of this doctrine of selection for freedom from disease may be indicated briefly here, though the general subject of diseases will be dealt with later on. The prevalence of Fiji disease some years ago was almost certainly due to infected cane being planted before growers knew much about it. Later, when losses had inculcated greater care, farmers largely controlled the disease by using for seed purposes only clean canes, and by rooting out every infected stool as soon as the disease manifested its presence in the crop. Gumming is also a condition that is easily detected, but it has spread extensively, and the facts suggest that the disease is planted with the sets. Yet the presence of gumming can be easily proved by exposing a cut cane to the sun for a few minutes. The oozing of a waxy substance from the cut surface will presently tell the tale. With such a simple method of detection, and by the employment of methods of cutting the sets that are not likely to spread the disease from clean canes to infected ones, it should be possible to keep the farm fairly free from it.

Thus the indications of the presence of disease require to be studied, more especially as disease is often present in an incipient state without greatly affecting the standing crop, but yet sufficient to spell disaster if the cane were used for seed purposes.

## The Value of Good Seed.

Upon this question of the importance of good seed, Dr. Cobb has written some very pertinent matter:—"Experiments corroborate ancient practice, exemplified by the best and most successful farmers of all time, namely, that the better the seed the better the resulting crop will be. This is not to say that good seed will always give a good crop and never a poor one, nor is it to say that poor seed may not give a good crop sometimes. The fact is that good seed under the same conditions as poor seed, will give better results. There is no exception to this rule."

"It is," he adds, "quite remarkable what fair crops can be raised from comparatively poor seed—given good soil, good tillage, good season, and no pests or diseases," but the increase of the profits of sugar-growing in New South Wales and the development of the industry on a sound basis are not going to be by carelessness in propagation.

We have now a good stock of diseases on our rivers, and plenty of competition by growers in other parts of the world, and it is becoming increasingly unwise to use any but the best seed—increasingly important that we should use only the very best.

One of the lines upon which improvement is going to be effected is the growth of cane for seeding purposes. The suggestion, no doubt, savours of the extravagant to the cane-grower, but let him take stock of the situation. The wheat-grower is learning that such high-class seed as the Department grows on the various farms in the wheat belt has a value far above its price per bushel. The maize-grower is finding that maize grown on scientific lines and by the selection of individual plants is giving quite remarkable results. The potato-grower is becoming conscious of the same thing; so also even the dairy-farmer who tests out the good and bad of his herd. Can the cane-planter expect that anything else shall be true of his crop? The individual, tested row—closely inspected and rigidly thinned out for every semblance of weakness, unthriftiness or disease—is becoming a prime method in agriculture, and it will yet be so in respect of cane.

There is more ahead of the careful, enthusiastic grower than there is behind him—more of zealous attention to detail—more of enthralling interest and instruction—more of certainty of results and therefore, too, of profit.

The seed or "sets" vary somewhat in size, according to the ideas of the grower, but two or three eyes per plant seem to be the best. Long sets of several eyes are apt to be disturbed by cultivating implements, and this is particularly injurious to the young plant, for it is very tender in the earlier stages and intolerant of rough treatment. One farmer on the Clarence lately affirmed his belief in sets of one eye each, holding that they come up quickest, and that it takes less cane to plant a given area. A crop that he planted on these lines will be watched with interest, but on the whole a longer set seems to have the sanction of experience. Groenewege, discussing the occurrence of gumming in Java, makes the remark that "cuttings with one node only should never be used."

Damage is often done when the canes are being cut, the ends being shattered and split in such a way as to allow of the entrance of fungi when the sets are placed in the soil. In the early days of the industry this was a matter of small consequence no doubt, but land that has grown cane for many years is now well stored with fungi of various kinds that take advantage of every means of entry. Dr. Cobb found this a most important point in the cane-sick lands of Hawaii, and it may yet acquire significance here.

### Change of Seed.

Change of seed seems to be desirable with sugar cane as with many other crops, and no doubt this has been one reason for the numerous varieties that have followed one another across the path of the grower. It is universally accepted that sugar cane of one variety should not be followed on the same land with another plant of the same variety, and doubtless experience points definitely that way. Let it be interpolated, however,

that if any farmer imagines that change of variety complies with the principles of rotation as good husbandry, he is quite in error. The practice absolutely fails on that score, valuable as it may be for other reasons.

It is perhaps not out of place to remark here that there is no reason why every variety should "run out" in time and follow the course of those that have "run out" before it. "Run out," it is to be feared, is largely the consequence of farmers' own crude methods of selection and neglect of the sound indications of virility and freedom from disease. In other words, it is the result of successive plantings with little regard for the characters that should be perpetuated, and for those that should be eliminated or controlled. "Run out" is not an essential of the industry, and a recognition of this might yet see some excellent old varieties that growers are inclined to bemoan coming into favour again.

On the score of change of seed, it might be remarked that the introduction of seed from one district to another, especially from somewhat harsh conditions to more favourable ones, is good practice in the culture of some crops, being frequently followed by good yields. At the same time it should be remembered that experience also shows that given sound methods of selection and culture, acclimatised seed has recommendations that the grower cannot afford to ignore.

### Intercultivation.

The working of the land under a young cane crop is generally on the lines of flat cultivation in the earlier stages, the objects being (1) to prevent the loss of moisture and (2) to control weed growth. Cane-farmers appear to be well aware of the value of a loose surface as a means of conserving soil moisture, and also to realise that the quantity of plant-food available in the soil at any one time is limited, and that if weeds are allowed to take an ample supply for themselves, then the more valuable cane plant is deprived of essentials to its development.

The harrow is usually employed while the plants are still small, successive workings filling in the plant furrow until the crop becomes too tall to be treated in this way. A Planet Jr. horse-hoe, fitted with narrow tines for scarifying purposes is used by many as the plants grow. A few farmers even open up the ground on either side of the plants when they are two or three weeks above ground, leave it so for a few hours—perhaps for a day—and then break the middles, thus throwing the soil back upon the plants. The effect is no doubt to aerate and warm up the soil while yet it is possible to get close to the plants; later on as the roots spread this would be impossible.

For later cultivating operations, the disc cultivator seems to be favoured by many farmers. It is largely used on the coast by maize-growers, having a raised frame that enables it to be used on a crop until it has attained a height of 3 feet 6 inches; this frame can be lowered and the discs reversed to convert the implement into a disc harrow. With this or some similar implement the rows are inter-cultivated and the drills hilled up, the work

being continued as long as possible, especially in a dry season. Where square planting permits, intercultivation is carried out first in one direction and then the other; in drill planting this is impossible and the hard condition into which the soil gets where the implements cannot reach is one of the great disadvantages of that method. Hand chipping is no doubt possible, but it is a very laborious and costly matter, and the drill planter must satisfy himself by going as close as he can without damaging the plants. Presently the cane covers the ground completely and further cultivation is unnecessary.

### Stripping and Cutting.

Trashing or stripping, which consists of the removal of the dead or dying leaves as the cane grows up, is an operation that is variously regarded. Its effect is to expose the cane to the maturing influences of light and air, and on the whole there seems to be reason to consider that the effect is to increase the sugar content. On the other hand, injudicious and careless stripping is very liable to leave wounds through which fungus diseases may obtain an entrance. Dr. Cobb made the remark that "when cane is stripped, care should be taken not to remove any of the leaves that have a living connection with the stalk, as this results in wounds that are likely to admit disease. . . . . . . It is better to remove too little than too much!"

The operation of trashing is practised by very few on the Richmond, but on the Clarence the majority of farmers attach some importance to it. As already stated there are those who specially value it as a means of ensuring good ripe cane for the purpose of sets, on the ground that the buds are developed by the light and air admitted, but Dr. Cobb in particular regards the natural covering as beneficial to the eyes, except when certain insects are present that shelter between the leaves and cane.

The cane crop is removed between July and December, according to whether it was planted early or late and to the conditions that have obtained during growth. Occasionally a plant crop matures with unusual rapidity, but on the whole it is the first ratoon crop that is cut earliest in the season. The experienced grower does not need to be told that the cane must be cut as close to the ground as possible; not only is the maximum weight of cane obtained in this way, but also that part of the cane in which the sugar content is greatest and to which, therefore, the greatest value attaches.

Harvesting has become a well-organised operation, upon the details of which it is unnecessary to linger.

(*To be continued.*)

In the distance—Harwood Mill.

## Baiting the Wedge-tailed Eagle.

The annual loss occasioned among the flocks of the Riverina by wedge-tailed eagle is very high, and under drought conditions their depredations are even more marked. On one station between Wyalong and the Lachlan, on what may be regarded as a safe estimate, 2,000 lambs per annum are taken by these birds, and even full-grown sheep fall easy prey to them; calves, marsupials, and dogs are also included in their predatory attacks. With sheep their usual mode of attack is to cut out the victim, and then, by continually swooping at it, to drive it until it drops or is felled by a blow of the wing. Unless particularly ravenous, the birds confine themselves to ear and eye on the upper side of the victim and, after removing the side of the face, tear out the tongue.

The writer recently had the opportunity of observing the method adopted by Mr. R. B. Robb, manager of Wollongough Station, Ungarie, in dealing with this pest. The experience of Mr. Robb indicates that attempts at shooting the bird with gun or rifle are practically futile, but that trapping along certain lines is highly successful; on small holdings almost every eagle should be accounted for.

Mr. Robb's system is as follows:—Ordinary rabbit traps are placed slightly below ground level and lightly covered with earth, not less than 18 inches from the bait; if closer than this the bird will probably stand back and reach the bait over the traps. A sheep's head makes an excellent bait, but almost anything (such as rabbits, hares, or birds), freshly killed, may be used. Stale baits are utterly useless. Care must be taken also to spike the bait firmly to the ground, for otherwise the bird will swoop and lift it in its claws.

It has been found profitable to utilise two or at most three traps at each centre, thereby securing a wider range of distribution. The eagle is compelled to approach the bait on the side nearest to the trap by means of a light breastwork or "background" built of sticks or bush, care being taken to make it too light to carry the weight of the bird. It is imperative also that the traps should be free, for if firmly anchored the struggles of the powerful captive are almost certain to result in the dismembering of its foot—the usual point of seizure—and its consequent escape. If, however, the traps are weighted only sufficiently to prevent the birds from rising from the ground, this danger is almost completely avoided, and it is always an easy matter to run down the captives. The birds are usually caught shortly after sunrise or within an hour of sunset, and if the traps can be visited twice daily there is little likelihood that they will escape.

Decoys are a highly important factor in the work, and it is customary to utilize a number of the captives for this purpose. The wing feathers are, of course, closely cut, and the birds tethered—preferably by a strong dog-chain to the leg, the ring end being secured to a stake about 30 inches in height. If decoys are regularly watered and fed with fresh meat, they will, in most cases, soon settle down.

In preparing birds to act as decoys the greatest care must be exercised, as the eagle is capable of inflicting a very severe and dangerous wound. They can, however, be handled with comparative safety by placing a light pole across the body of the trapped bird, and by keeping one foot upon it to hold it firmly in place while the wings are cut and the tethering chain adjusted. It is advisable to use a leather band for fastening the chain to the leg, in order to avoid chafing, thereby tending more fully to maintain the vitality and efficiency of the decoy.—G. C. Sparks, Inspector of Agriculture.

# Safeguarding Farm Stock from Disease.

## (3) By Correct Feeding.

[Concluded from page 814.]

MAX HENRY M.R.C.V.S., B.V.Sc.

### SHEEP.

The principles affecting the feeding of sheep are studied still less than those affecting the feeding of other animals, but in drought periods their consideration is often a matter of very great importance, demanding attention in relation both to cost and to prevention of mortality.

Sheep grazing in paddocks are subject to the diseased conditions associated with the same method of feeding in cattle—that is, tympanites when brought on to succulent feed suddenly, impaction of various organs of digestion after a long course of dry feeding, acute poisoning from prussic acid developing plants, and slow poisoning from Darling pea, &c. Tympanites or hoven usually occurs in mobs of travelling sheep, sheep just off trucks, and those recently brought from a dry area to more favoured spots. The losses are at times exceedingly heavy, and those measures of prevention which can be utilised with animals on a farm or holding—methods such as only allowing the animals to remain a short time on such succulent grazing or supplying them with some dry food before allowing them on it—are often not practicable. Any such steps as are possible, however, should be taken.

The second common cause of mortality—impaction of various organs—is not so readily recognised or dealt with, since it is apt to be of slow onset and to follow a long period of dry feeding. The tendency is to regard the fact that sheep have lived for some considerable period on scrub or very dry innutritious food as evidence that the food is sufficient for them, but as a matter of fact a continuous lowering in tone is taking place, varying in degree according to the quantity and quality of the food. This lowering in tone may be so slight that no ill effects are observed, and when good feed comes again the sheep recover their tone; on the other hand, it may be so marked that the digestive system becomes unable to deal with the food, impaction results, and heavy mortality may follow. This is particularly liable to occur in pregnant ewes towards lambing time, and in sheep that are travelled or put to some other strain. In between these manifestations are all gradations of the trouble, and in many cases only small numbers of the weaker sheep may die. What the animals suffer from is actually slow starvation. The impaction is certainly increased by the astringent nature of so many scrub fodders. It is impossible to lay down any hard and fast rules as to when and under what particular conditions mortality will occur, but it is obvious that the longer the period of innutritious feeding the more

likely it is to have unfavourable results. Experience with the particular fodders used and the conditions existent on each holding must serve as the owner's guide.

It is plain that prevention of such mortality as is under consideration depends on the supply of food which will counterbalance both the lack of nutritive quality and the astringent nature of the scrubs and rough, dry fodders. Although to prevent all ill effects this must be undertaken throughout the period of dry feeding, it is remarkable how rapidly sheep will recover from very severe loss of tone and impaction—even after deaths have occurred in the flock from these causes—if the food is changed. Loss of lambs through deficiency of milk in the ewes (an indirect effect of the trouble discussed) may also be guarded against at the same time by use of the same measures.

The most useful way of considering the question of measures likely to prevent losses will be to take in turn the various feeding materials used in carrying sheep through a dry time and to note their value, and the most satisfactory method of utilising them. In doing so it must be borne in mind that financial considerations and the number of sheep to be dealt with must modify the decision on these points to a degree varying with any particular case.

*Oats.*—While this is a very good grain food for sheep, it does not appear to equal maize; as a sole food, owing to its larger husk content, it is superior to wheat. It is usually fed either by scattering or in troughs, but (as with all grains) scattering has considerable drawbacks, as a certain quantity is wasted, and in picking it up off the ground the sheep are bound to become sanded to a certain extent. In some instances sanding has increased the ill effects of impaction, if it has not directly caused mortality. It may be said here that no grain alone can be a satisfactory feed for a ruminant animal over long periods, and the fact that sheep have been brought through certain periods of drought on a grain ration does not invalidate this fact. Owing to its comparatively high nitrogen content oats form a useful adjunct to silage, straw, and chaff feeding.

*Maize.*—This appears to be about the most suitable grain to feed to sheep, and owing to its larger size there is probably less lost in scattering it than is the case with oats and wheat. It does not alone provide such a balanced feed as oats, however. It will give better results if fed with lucerne chaff than with oaten or wheaten, or a small ration of meal may be combined with the wheaten chaff to create the balance.

*Wheat.*—Much used in feeding sheep by both methods. Pretty well equal in value to maize. Best if fed with lucerne chaff. General remarks on oats as feed apply to maize and wheat also.

*Bran.*—A most valuable feed for breeding ewes. Keeps the digestive tract in good order, and, being fairly rich in nitrogenous matter, can be used with oaten or wheaten chaff without the addition of grain. A small chaff and bran ration of roughly equal parts, trough-fed, is very useful when sheep are on scrub or dry innutritious fodder.

*Chaff (oaten or wheaten).*—Has not the same value as lucerne, but is a good bulk food. Really good chaff, as produced in this country, can be fed alone, and will provide good sustenance without additional food, though it is better to add bran for breeding ewes. Poor chaff is not very much better than straw.

*Straw.*—Can be very largely utilised in the feeding of sheep; and while barley straw is probably the best, oat and wheat straw can both be made use of. Its palatability is greatly increased and its nutritive value raised if given with molasses. If a lucerne ration is being fed, straw can be used to replace portion of this ration, without lowering the value of the ration to a serious extent.

*Silage.*—Silage is always of value. To obtain the best results some portion of the feed should be dry roughage, such as lucerne hay or straw.

*Linseed and other Meals.*—Supplied in small quantities to sheep being trough-fed on chaff or straw, these can entirely replace bran and grain, as they are rich in nitrogenous material and in mineral salts.

These notes apply to the feeding of sheep in dry periods with a view to preventing mortality apart from actual starvation—although, as already indicated, nearly all such mortality is really at basis slow starvation. It is not intended here to discuss feeding from the point of view of fattening, but it may advisedly be pointed out that so long as our sheep are exposed to the extremes of feeding which exist in New South Wales, so long must heavy mortality be expected. The maintenance of food supplies on a more even basis would prevent a very great deal of this mortality, and though such ideas are impracticable to a great extent in the case of the large sheep-run, they are not so on many sheep farms. The most obvious methods of ensuring it are the conservation of hay and silage, the subdivision and spelling of paddocks, and the growing of crops for grazing. The future must inevitably see a great increase in the application of such methods of reducing mortality.

As already pointed out, much loss occurs from continued dry feeding, and yet further loss is involved in the sudden change to extremely succulent food. Surprise is often expressed that mortality in sheep is so heavy after the appearance of what is referred to as good food, but as a matter of fact such rapid-growing succulent food as appears after copious rains following drought possesses very little body, and in the already weakened condition of the animal will not sustain life, particularly as at such times the animal requires the production of a good deal of bodily heat. The question then arises of the possibility of supplying some dry roughage in addition to the green food.

Apart from these direct effects of feeding on mortality, it has, it may be reiterated, a somewhat indirect influence in leading to many deaths among ewes prior to lambing. It is not suggested that every such case is dietetic in origin, but it is desired to stress the intimate connection between feeding and many such cases of heavy loss. These deaths are in all probability due to a complexity of causes beginning with lack of digestible and

nutritive food, leading to a slowly developing atonic condition of the digestive tract, which becomes less and less capable of dealing with what food is available. The strain of advancing pregnancy is added to these difficulties, a tendency to constipation is induced by the fibrous astringent food, and as a result of these multiple causes the weakened animals succumb. If at the first sign of such mortality food of the nature of bran, lucerne, linseed meal, &c., can be provided, it may be almost entirely checked.

### Poisoning.

At times heavy losses occur in sheep as a result of plant poisoning. Blue couch and rosewood have been responsible for many deaths as a result of the formation of prussic acid, and variegated thistle has killed many, probably from the same cause. Very little can be done to prevent this as there is no indication when the plants are likely to be poisonous, but warnings issued with regard to particular patches of country have at times been disregarded with disastrous results.

The commonest form of chronic poisoning is that due to Darling pea, which can only be dealt with by getting rid of the plant. There are, in addition, many other plants concerning which our information is very vague and unsatisfactory, and concerning which there is urgent need for investigation.

## PIGS.

Feeding and disease are not so intimately connected in the pig as in other animals—largely because in the majority of cases the feeding is more controlled, and because, whereas with other stock most of the trouble is due to the nature of the food, with pigs the most serious disease (that is, tuberculosis) is due to infected food. It may safely be said that the great majority of cases of tuberculosis of the pig in this country are due to infection by tubercular milk and milk products, and the only satisfactory method to safeguard the animals is to boil such food before feeding it.

The amount of mineral salts (particularly lime and phosphates) in the food of pigs is of considerable importance, and the disease commonly known as rickets is largely due to deficiency of these ingredients. In cases where the pigs are affected a change of diet is advisable, and food fairly rich in these salts, such as bran, pollard, lucerne hay, clover hay, &c., should be tried.

One of the common forms of poisoning in the pig occurs from the administration of brine with the food, either through ignorance or carelessness. Otherwise poisoning is generally due to the careless handling of rabbit poison.

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DISCUSSING the scorching effect of sea-winds on foliage, L. A. Boodle, in the *Journal of the Ministry of Agriculture* (London), concludes that it is chiefly due to the drying action of the wind, but that salt may perhaps occasionally contribute towards the production of an injurious effect.

# Banana Root Borer

(*Cosmopolites sordidus* Germar).

T. McCARTHY, Assistant Entomologist.

As in many other places where the banana is now extensively grown, the banana root borer *Cosmopolites sordidus* has been introduced into the Tweed River district. It was first brought under notice four years ago, but was probably introduced earlier in banana suckers obtained from Queensland, where it has been known for at least twenty-five years. It has not thus far been responsible on the Tweed for such considerable damage as it is said to have done in Fiji. At present there is no general infestation in the Tweed River district, the beetles being confined to isolated areas, practically all of which have been infested by the planting of beetle-infested suckers.

The original home of the beetle is unknown, but it is not a native of Australia. It was first described by Germar from Java in 1824 as *Calandra sordida,* but Chevrolat in 1886 established the genus *Cosmopolites* for this species. It is widely distributed in the tropics, having been recorded from Lower Congo, Madagascar, Mauritius, Seychelles, Ceylon, India, Malay States, Saigon, China, Java, Sumatra, Borneo, New Guinea, Fiji, Brazil, Trinidad, West Indies and Florida.

According to literature published, the banana beetle appears to confine itself almost wholly to bananas, though Newell states that it also attacks sugar-cane. All varieties of bananas are attacked. Jepson states that the borer does not display more partiality for one variety than another, but in St. Lucia, Dr. Hutson states it seems to prefer the plantain, the cultivation of which is being abandoned there for another variety in the hope that it may be less susceptible to the attacks of the beetle. No choice is, however, available on the Tweed River, as the Cavendish banana is practically the only variety grown.

## Character of the Injury.

The injury is caused by the larva or grub of the beetle feeding and tunnelling in the root-stock or bulb of the banana. (Plate II, Fig. 10.) The greater part of the damage occurs in the outer part of the bulb, where are located the fibro-vascular bundles which convey the nourishment to the growing parts of the plants. The normal supply of food to the plant is thus obstructed, and the growth of the suckers arrested, causing the leaves to die prematurely, and finally the roll of unopened leaves or the growing point of the plant to wither, as is shown in the illustration on page 866. The tunnels, which are roughly circular, are at first small, but as the grub feeds it increases in size, and the tunnels are enlarged accordingly until they attain a diameter of about one-quarter of an inch. Eventually the bulbs become riddled with these circular tunnels, permitting the invasion of fungus and bacteria, which soon reduce the whole bulb to a blackened mass

of decaying tissue. In this condition it is deserted entirely by the beetle larvæ. Badly infested suckers are easily pushed over, and in some cases I have found the larval tunnels extending up to the stem 12 inches above the ground level. Where a plantation is badly infested no fruit may be produced, or, if any, the bunches are small and the fruit undersized. From what I have observed, however, a considerable time may elapse before a

**Arrested growth of Suckers, due to attacks of Beetles.**

plantation, originally laid out with infested suckers, begins to show any material effect of the infestation. I have seen a plantation originally planted with infested suckers still producing good bunches four years after planting. Where the infestation is the result of a natural migration of the beetles themselves from one plantation to another, it would take much longer to show a definite effect in a plantation.

The presence of larvæ in a stool may or may not be directly discernible. This seems to depend largely on the degree of infestation. If the stool is badly infested, the suckers show evidence of arrested growth and premature dying of the leaves. This, it must be remembered, can also be produced by other agencies. On the other hand, a partially-infested stool may bear a normally healthy appearance.

*How to Detect Infection.*—On mere appearance there is no certainty whether infestation is present or not, but where any of the foregoing symptoms, however slight, are showing the presence or otherwise of the beetle can be easily determined by the planter. The original parent bulb is usually the centre of infection, so that the most advanced stage of attack will be found in the stumps in the middle of the clump. These can be sliced downward with an ordinary sheath knife, and if infested the tunnels and larvæ of the beetle can be readily seen, as in Plate II, Fig. 10. Suspected suckers also can be cut off through the bulbs and sliced, when the tunnels and sometimes the larvæ are revealed.

## Description of Stages.

*The Adult.*—In general appearance the adult beetle resembles the common grain bettle, except that the former is many times larger. Found in its usual moist habitat (the decaying banana bulb) the beetle, except when newly hatched, when it is reddish-brown, is of a uniform black colour; but when dried, the body is covered with a thin incrustation which gives it a greyish appearance. The whole body is thickly and evenly punctured, with the wing covers or elytra bearing impressed lines of striæ containing rows of punctures. The elytra are slightly shortened, freely exposing the pygidium, which is pubescent and covered with setigerous punctures. The body divisions, head, thorax, and abdomen, are distinct. The head is small and spherical, deeply imbedded in the tubular apex of the prothorax and prolonged in front into the usual snout or rostrum. The latter is moderately curved downward, thickened between the antennæ, with the mouth parts situated at the apex. The antennæ are elbowed. The prothorax is long, narrowing towards the apex, with a thin, irregular, smooth, medium, longitudinal strip on the dorsal surface. The legs are stout, the femora thickened at the distal end, the tibiæ terminating in a hook and the tarsi four-jointed.

Length, 12 mm. Breadth at base of elytra, 4 mm.

Between the sexes no marked variation in size occurs, nor is the size of the rostrum, as suggested by Tryon, a reliable distinction. The sexes, however, can be easily differentiated by the first ventral abdominal segment of the male (Plate II, Fig. 3) being more or less strongly impressed in the middle, while in the female (Plate II, Fig. 5) it is flat or even slightly convex. The rostrum also exhibits some sexual váriation (Plate II, Figs. 2 and 4), but only in so far that the rostrum of the male is more coarsely punctured, and the punctures, though becoming finer, extend almost to the apex. In the female the apical half of the rostrum is practically smooth (Plate I, Figs. 4 and 5).

*The Egg.*—The egg is elongate oval, about 2 mm. in length, and pure white in colour (Plate II, Fig. 6).

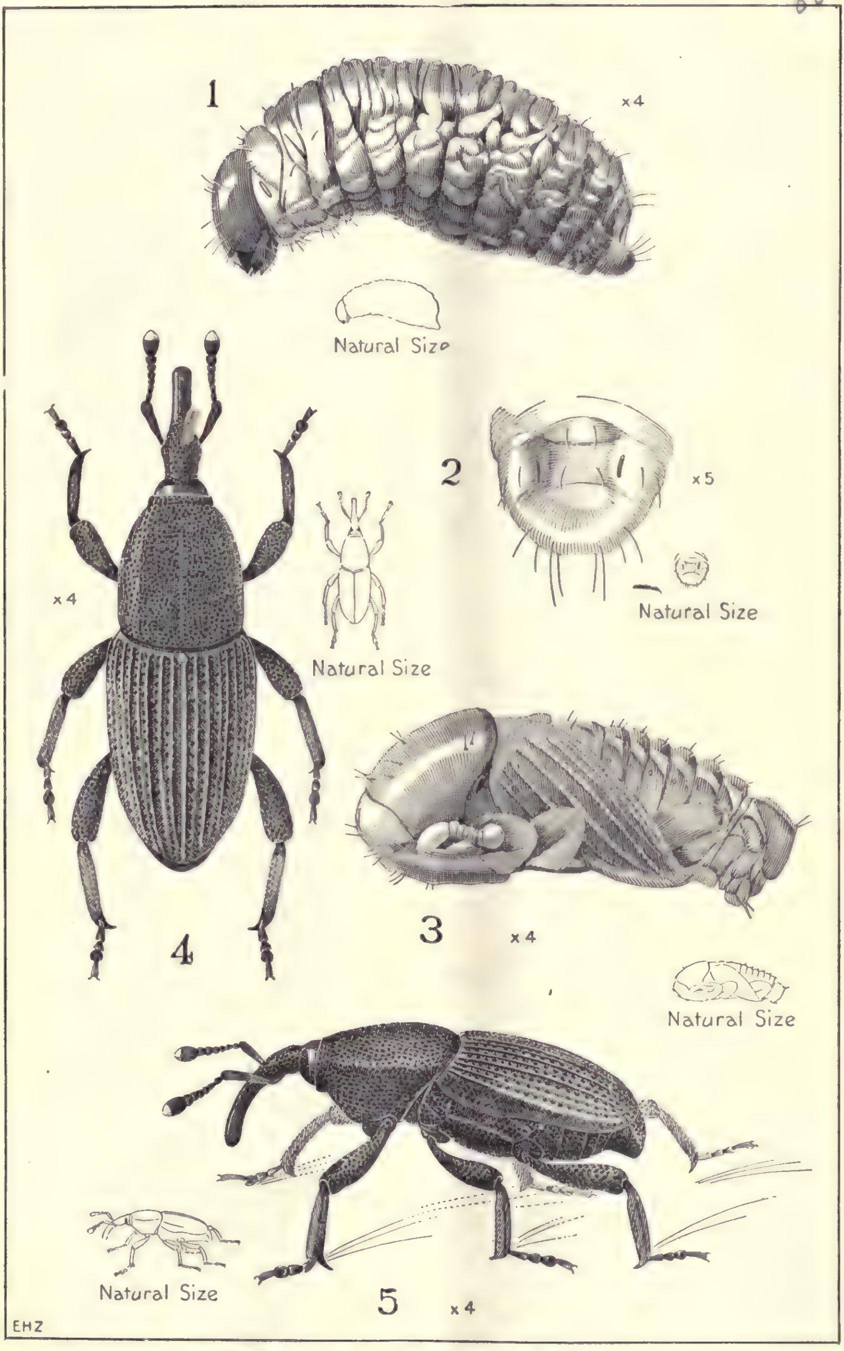
*The Larva.*—The mature larva is a creamy white, stout, fleshy, legless grub, with the body distinctly curved. The head is prominent, rounded, dark reddish-brown in colour, and emarginate behind. The mandibles are dark brown, well-developed, with the tips bidentate. Beyond scattered spine-like hairs on the head, thorax, and abdominal extremity, the body is naked, with the upper surface wrinkled and the segmental divisions of the body showing more distinctly on the under-surface. The three thoracic segments are rather more developed than the abdominal ones, the mesothorax bearing a pair of elongated spiracles. The first seven abdominal segments are normal in form. In the mature larva, these segments increase in size to the fourth and fifth, which are the largest, and then contract toward the anal extremity. This gives the whole body of the larva a swollen appearance towards the middle. Each bears a pair of minute indistinct spiracles. In accordance with other Calandrid weevil-larvæ, the eighth and ninth segments are much modified, and visible dorsally as somewhat chitinised sloping plates, giving a truncate appearance to the hind end of the body. Average length, 13 mm (Plate I, Fig 1).

*The Pupa.*—The pupa is elongated and white in colour with the structure of the future beetle plainly visible, the rostrum, antennæ, wing pads, and legs all being prominent. It has four pairs of large tubercles set with bristles on the head and snout, while the thorax, which is large and rounded, also bears six pairs of tubercles set with bristles. The first six abdominal segments normal, each bearing three pairs of bristles, borne on tubercles which are placed so close together as to form a ridge-like prominence on either edge of the dorsal surface. The spiracles on these segments are larger and more prominent than the larval spiracles. The remaining abdominal segments are greatly modified. Dorsally the seventh is elongate, with two pairs of tubercles set with bristles. From a lateral view it is seen that the seventh segment is dorsally the terminal segment, but ventrally it is emarginated for the reception of the other segments, which extend slightly beyond it. The ninth is set with two long chitinous processes at the sides of which are a pair of stiff spines. The pupa has two large spiracles situated prominently on the base of the prothorax as in other Calandrinæ.

Length, 12 mm (Plate I, Fig. 3).

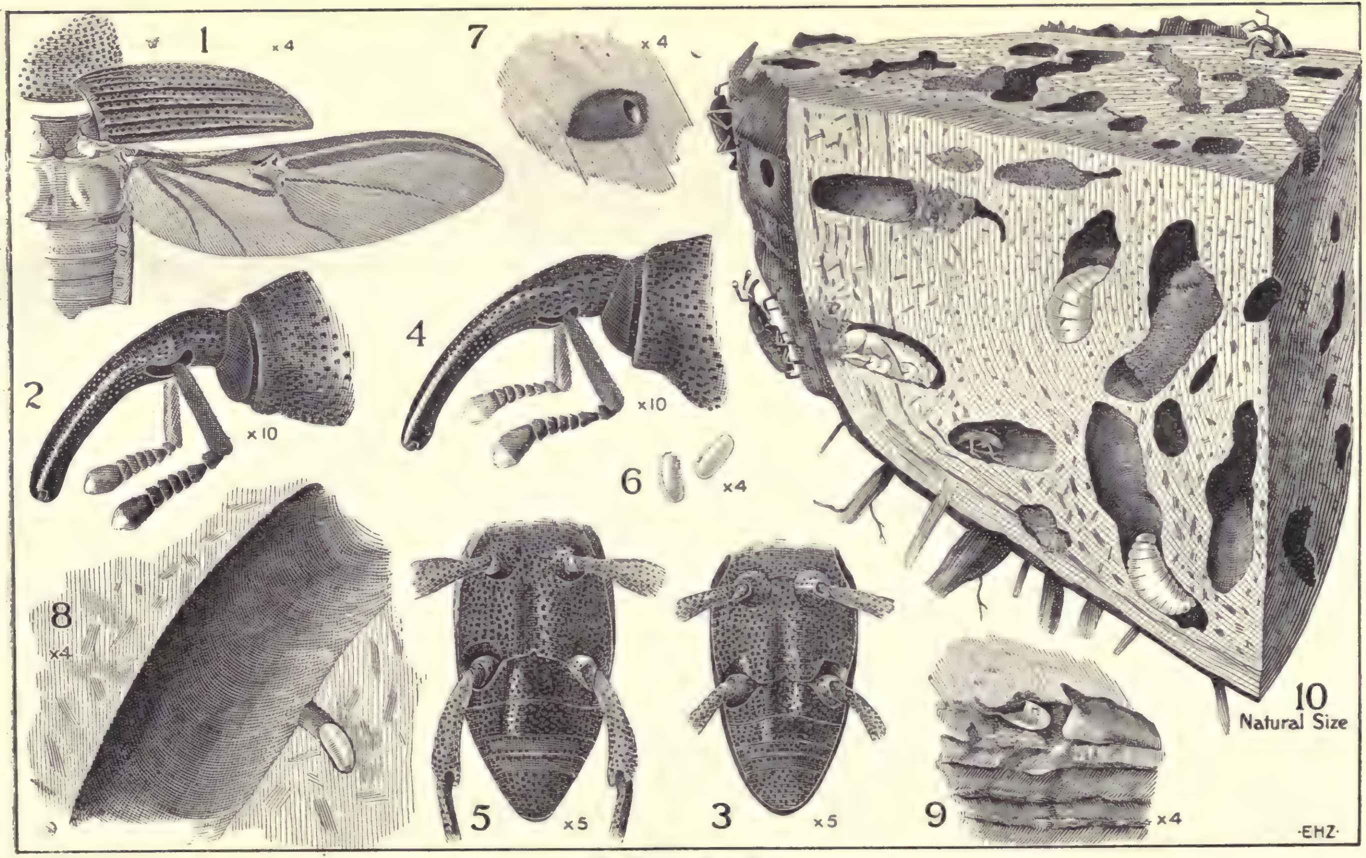
### Habits and Life History.

The beetle is associated with the banana plant in all its four stages—egg, larva, pupa, and adult. The adult weevils are nocturnal, hiding by day in or around the decaying bulbs or between the leaf sheaths of the plant above the ground, and coming out at night to feed on the plant juices and to lay their eggs. They are very sluggish and move about slowly when wandering at night, contracting the legs and feigning death when disturbed. The adults are long lived. Four hundred adults, collected in April from the bulbs of plants at Tweed Heads and transferred to Sydney in decaying




**The Banana Root Borer** (*Cosmopolites sordidus*).

1. Larva of Banana Root Borer. 2. Upper view of anal segment. 3. Pupa. 4. Dorsal view of beetle. 5. Side view of beetle.




**The Banana Root Borer.**

1. Wing of the beetle.
2. Rostrum (or snout) of male.
3. First ventral abdominal segment of male.
4. Rostrum (or snout) of female.
5. First ventral abdominal segment of female.
6. Eggs of beetle.
7. External appearance of egg cavity.
8. Section of tunnel with egg *in situ*.
9. Egg *in situ*, on crown of bulb.
10. Section of infested bulb or root stock.

PLATE II.

banana bulb, were all alive five months later notwithstanding that the winter had been abnormally cold and prolonged. Under natural conditions, therefore, life must be of considerable duration.

Although the beetle has wings (Plate II, Fig 1) apparently ample, its capacity for flight has not been definitely established. Some writers assert that the beetle flies, but they do so without authentic confirmation. Some importance must be attached to this point, for if the beetle can fly the value of quarantining plantations as a preventive against the spread of the beetle would be lessened, as infection would then be carried from one plantation to another by direct flight of the beetles. Observations and tests I have carried out, however, while not as yet conclusive, undoubtedly indicate that the beetle does not fly, and infection must be due either to the beetle crawling from one place to another, or, more generally, to the planting of infested suckers. Not only do the wings appear to have lost the power necessary for flight, but I have carefully observed the beetle crawling at night without noting any attempt to fly or even to extend the elytra, as would be expected if the insect could fly. Nor can they under any circumstances be induced to fly.

In the Tweed River district infestation, in almost every case, was directly traceable to the planting of infested suckers. If the beetles fly, healthy plantations adjoining infested ones would, it seems likely, become sporadically infested. But this does not occur. In only one instance did I find an adjoining plantation infested, and this in two rows immediately contiguous to the most heavily infested section of the infested plantation, indicating that the beetles had crawled over to the clean plantation. Even if the beetle can fly, its habits suggest that the power of flight is rarely if ever utilised, and that it does not move far from the place where it is developed so long as suitable food is available for the egg-laying female.

Normally the eggs are deposited singly in cavities that the female prepares for them with the aid of the mandibles located at the tip of the beak or rostrum, notwithstanding the fact that some eggs may be dropped loosely on the ground close to the bulb, or among the sheathing bases of the leaves. The locality mostly favoured for the deposition of the eggs is between the leaf-sheath scars on the crown of the bulb just above the ground (Plate II, Fig. 9). Many eggs, however, were also found deposited throughout infested bulbs, the egg cavities being excavated through the sides of the larval tunnels (Plate II, Fig. 8). In captivity, also, the beetles laid freely in the cut surfaces of portions of banana bulbs placed in the cages as shelters for them, notwithstanding that banana suckers were provided for the purpose as nearly as possible to natural conditions. The number of eggs laid by a single female has not been determined, but it seems that the beetles breed continuously and that there is no marked division into definite egg-laying periods.

On hatching the young larva measures nearly 2 mm. in length, and resembles the mature larva except that it is paler in colour and without the pronounced thickening of the fourth and fifth segments. It immediately tunnels downwards into the bulb, the cavity prepared by the female for the

reception of the egg affording it a safe and easy means of entry into the bulb. At first the channels are almost indiscernible, but they gradually grow wider as the grub matures. On attaining maturity the grub usually makes its way towards the surface of the bulb where the channel, which is partially filled with sawdust-like particles of rejected banana tissue, terminates in an oval chamber prepared by the grub. In this chamber the grub undergoes its final moult and transforms to the pupal condition. No true cocoon is formed as in the case of the sugar-cane beetle (*Rhabdocnemis obscura*), but the presence of a few strands of banana fibre on the inside of the pupal chamber and the plugging of the outer end of it with a roll or pad of banana fibres (Plate II, Fig. 10) indicates that the cocoon-making habit has been largely lost.

On emerging from the pupa the beetle, which is at first reddish-brown in colour, does not immediately leave the pupal chamber, but remains until its tissues have hardened up, its colour in the meanwhile gradually becoming darker and darker. The adult males and females are much alike, but can be distinguished by the characters previously mentioned.

With regard to the proportion of sexes, males predominate. Taking one hundred specimens haphazardly in a plantation, I found fifty-nine were males and forty-one females, and this percentage was supported later in the laboratory in the examination of a large series of specimens.

With regard to the periods occupied in the various stages of the beetle development, Jepson has found that the egg period lasts five to seven days, the larval period about twenty days, and the pupal period six to eight days. These have been approximately confirmed by Moznette. My experiments indicate, however, that the periods are more prolonged, more particularly in the egg-stage, which I invariably found to be nine or ten days. The difference may be accounted for by the sub-tropical conditions under which my observations were carried out, but further observations are being made, pending which definite statements may be withheld.

## Seasonal History.

Normally the insects pass through the winter in the adult stage, but some grubs are also found in the bulbs throughout the colder period. These grubs are from eggs that were laid late in the autumn, and the grubs, developing during the winter, are full grown in September, when they pupate and emerge. The majority of the grubs, however, have changed to beetles by the end of autumn and pass the winter as adults.

In captivity no eggs were laid from May to September. Examination of the ovaries throughout the winter revealed no egg development, but early in September some well-developed eggs were found on dissection. The beetles began to deposit eggs late in September. The conditions under which the eggs were laid in captivity were as near as possible to those experienced under natural conditions. It seems, therefore, that in the Tweed River district the first eggs after the winter are laid in September, and that egg-laying is continued throughout the following months up to April.

### Precautionary and Control Measures.

*Precautionary.*—Too much importance cannot be attached to the necessity for planting clean and vigorous suckers. In selecting the latter, care should be taken to see that they are strong and healthy, and that they are obtained from a plantation beyond suspicion as to the presence of beetles. In addition, every sucker should be carefully examined for beetle infestation before planting, and any sucker about which there is the slightest doubt should be destroyed without hesitation. No precaution in this respect can be too drastic when laying out a plantation, as it often saves much labour and expense later.

Under the Vine and Vegetation Diseases Act the removal of suckers from an infested plantation renders the owner liable to prosecution.

*Control.*—Owing to the mode of the beetle attack, no method of control, such as spraying, dipping, or underground fumigation has suggested itself as practicable. In an infested plantation the necessity for good cultural methods recommends itself as essential, and where these are employed I am of the opinion that damage by beetle can be kept down to an almost negligible quantity. In the Tweed River district more attention should be given to the employment of clean management and better cultural methods. Many planters, I have found, frequently expect their plants to produce a maximum of fruit with a minimum of attention. I have frequently seen suckers crowding all over the clumps, no attempt being made to prune them out. This reduces the general vigour of the stool, making it less able to withstand the effects of beetle attack. Observations tend to show also that plants lacking in vitality are more readily attacked by the beetle. In an infested plantation the fruit suckers should be limited to not more than five to ensure a more vigorous growth, while the removal and destruction from time to time of old stumps in the centre of the clump will materially assist in reducing the number of borers. As previously stated, I have found that the middle of the clump is usually the centre of infestation.

If the above methods are carried out, an infested plantation will continue to produce good bunches.

Where the infestation is beyond control, the banana plants should be dug out entirely and destroyed, as they only serve as ideal breeding grounds for the beetle.

*Trapping.*—Trapping the adult beetles will greatly assist in reducing the number of borers. Traps may consist of strips of banana stem or banana bulb cut in halves. The latter are preferable as they remain attractive to the beetle for a longer period, and being suitable for egg-laying, the female does not wander off after feeding in search of a suitable place to deposit her eggs.

When the cut surface becomes too dry it can be renewed by taking off a thin slice. It is important also that when the traps have dried up and ceased to be attractive to the beetles they should be replaced. The strong natural odour of these freshly-cut bulbs is very attractive to the beetles. They should be placed cut surface downwards around the infested stool or at intervals between the infested rows. The beetles are attracted to these traps

during the night, congregating underneath the trap, and should be regularly collected and destroyed each morning. The soil just beneath the trap should also be examined. It is inadvisable, unless under strict supervision, to place the traps among apparently clean stools, as otherwise the beetle may be attracted to healthy plants.

Where there is danger of a clean plantation becoming infested from an adjoining infested one (a condition previously stated to have actually occurred), traps can be usefully employed as a first line of defence. A double row of traps (the traps in one row arranged opposite the spaces between the traps in the other) can be placed between the two plantations, but nearer the infested one, and examined each morning, and any beetles destroyed. It must be borne in mind, however, that with such a procedure, rigid supervision of the traps is essential so that all beetles can be promptly collected and destroyed.

### Natural Enemies.

No natural enemies of the insect were found on the Tweed River, and the fact that the original home of the beetle is unknown makes the discovery of its true parasites rather difficult. Muir found no direct parasites either in Borneo or Java, but he states that they were attended by Hydrophilids and Histerids. The Histerid beetle, *Plœsius javanus,* was introduced from Java into Hawaii as a parasite of an allied species, the cane beetle borer (*Rhabdocnemis obscura*). It failed to establish itself, however. Jepson, in his mission to Java in quest of the natural enemies of the beetle, found the same beetle to be the most effective parasite of the banana beetle. He accordingly in 1913 introduced it into Fiji, where the banana beetle was doing considerable damage. Four years later, however, its establishment in Fiji also appears to be doubtful. Writing in 1917, Knowles states:—"Nothing has been seen or heard during the year of the predatory beetle *Plœsius javanus,* introduced from Java in 1913, but there is no reason to suggest any modification of the opinion expressed by Mr. Jepson last year that this does not necessarily mean that the beetle has died out, as it is not a very prolific one, and development is extremely slow." No conclusion can, however, be drawn, and from the nature of the Tweed River infestation I am of the opinion that, if this predatory beetle can be established, it would be of some value in controlling the banana beetle. As this Histerid is predaceous in both larval and adult stages, it is unlikely that it would be injurious in any way if introduced. Further information as to its habits and value as a check on the banana beetle is being considered before deciding upon its introduction.

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SAMPLES of potash salts obtained from the water hyacinth (*Eichhornia crassipes*) that abounds on the northern rivers have lately been submitted to the Department for analysis. It was found that the material contains 7·7 per cent of moisture and 36·12 per cent of potash ($K_2O$), the latter being present as chloride and sulphate. At the current unit-value for potash, this fertiliser is worth about £20 15s. per ton.—F. B. GUTHRIE.

# Some Recently Introduced Fodder Plants.

## TESTS ON THE SOUTH COAST.

R. N. MAKIN, Inspector of Agriculture.

THREE recently introduced fodder plants of importance were tested by the Department, in co-operation with farmers on the South Coast, during the past season. These were Sudan grass, Saccaline, and Elephant grass, all of which are liable to be cut down by frost.

### Sudan Grass.

Sudan grass is raised from seed, and is best sown in drills, so spaced that tillage to keep down weed growth and to conserve moisture is possible. About 7 to 10 lb. of seed are required per acre. The crop is one that will do well on good ground of the poorer class. Farmyard or artificial manures should be applied, and sowing should not be made until danger of frost is past. As a rule, October planting is safe.

Under average weather conditions two cuts for green feed or hay may be obtained in the season, the first generally within three to four months from time of sowing. Stock are very fond of this crop either as green fodder or as hay or chaff. Experiments with this plant for the first-mentioned purpose were conducted with the following farmers:—

L. B. Garrad, Milton.
Geo. Lindsay, Dapto.
J. H. Martin, Pambula.
J. Timbs, Albion Park.

At Milton the crop was broadcasted and was outgrown by summer grass, and perished. At Dapto the seed was sown with the wheat drill, sowing through every cup. Germination was good, but weed growth was troublesome. Only one cut was obtained. The soil was of sandstone formation.

The Albion Park soil was also of sandstone formation. On this plot the seed was broadcasted, but owing to the poor growth only one cut was obtained. At Pambula the seed was sown in drills 2 feet 9 inches apart, and the rows were kept cultivated. The soil was of sedimentary character. Two cuts were obtained.

All plots were treated with P7 mixture, which comprises superphosphate and bonedust in equal quantities, at the rate of 1 cwt. per acre. The following yields per acre were obtained:—

| | 1st Cut. | | | | 2nd Cut. | | | |
|---|---|---|---|---|---|---|---|---|
| | t. | c. | q. | lb. | t. | c. | q. | lb. |
| J. H. Martin, Pambula ... | 14 | 5 | 2 | 24 | 7 | 7 | 0 | 16 |
| Geo. Lindsay, Dapto ... .. | 5 | 11 | 1 | 20 | ........ | | | |
| J. Timbs, Albion Park ... | 6 | 14 | 1 | 4 | ......... | | | |

The large yields at Pambula, where drill-sowing and cultivation were carried out, are worthy of note. Excessive weed growth in the early stages of the growth of this grass is always a serious deterrent to a good stand.

Sudan grass is not likely to displace maize or sorghum for green fodder purposes, as under equal conditions it will not yield a greater bulk of fodder. It is a useful plant, however, and under suitable weather conditions it may be made into a very superior hay that is much relished by all classes of stock.

### Elephant Grass.

Plots of Elephant grass were established on the farms of the following farmers:—

J. H. Martin, Pambula.
E. G. Kelly, Bega.
L. B. Garrad, Milton.

The plants were set out in October, and were allowed to attain their full growth. The stems were then cut and thrown out to the stock, which in all cases refused them, the stems apparently being too hard and not sufficiently appetising. A yield of 49 tons 18 cwt. per acre was obtained at Pambula. After the first cutting another growth of stems appeared. These were cut when about 2 feet long and proved more palatable to the stock.

This plant might occupy waste land or be planted to stop erosion on creek banks.

### Saccaline.

A plot of Saccaline was sown on Mr. J. H. Martin's farm at Pambula. It was planted on 27th August, 1919, and cut 1st May, 1920, when a yield of 36 tons 14 cwt. of excellent green fodder was obtained.

The stems were very juicy and sweet, and were eagerly devoured by the dairy stock. This is a plant which requires a longer growing season than Planter's Friend, and seems to stand well into the winter months if not severely attacked by red stain disease.

## Two Lambings a Year.

"How soon after parturition may a ewe be satisfactorily bred from?" inquired a correspondent recently. It is only in occasional instances that a ewe will perform the dual functions of gestation and lactation at the same time. The most likely time to secure pregnancy during the lactation period would be from about three weeks to a month after parturition. If the object were to regain numbers as the result of the disastrous effect of the drought, not very much good would accrue from keeping the rams with the ewes all the time; a better plan would be to aim at a good autumn lambing, and then to draft off all ewes that have missed and mate them up again for a late spring or summer lambing. In order to avoid prostration through the ewes lambing in mid-summer, the first mating should take place as early in the spring as possible.—J. Wrenford Mathews.

There is no necessity to pinch back the tops of potatoes. The leaves manufacture the starch that is stored in the tubers, and any interference with the tops is therefore liable to detract from the yield.—A. J. Pinn, Inspector of Agriculture.

# Farmers' Experiment Plots.

## MAIZE EXPERIMENTS, 1919–20.

### Upper North Coast District.

W. D. KERLE, Inspector of Agriculture.

FIELD experiments with maize were conducted during the 1919-20 season by the following farmers in conjunction with the Department of Agriculture:—

G. A. Forrest, Coraki.
R. W. Hindmarsh, "Wiaraga," Bellingen.
E. A. Green, "The Risk," Kyogle.
G. P. Collins, "Colindale," Fairy Hill, Casino.
E. N. Mackinnon, Lawrence.
A. Menzies, North Dorrigo.
Henry Short, "Warrawee," Dorrigo.
Wm. Barnes, "Heatherdene," South Woodburn.
E. Amps, "Goldsborough," Camira Creek, Grafton.
F. J. Giblin, Burrapine, Nambucca River.
Mrs. F. T. Johnson, Condong, Tweed River.
Chas. Oliver, "Laurel Dale," Casino.

The experiments consisted of trials with varieties and with simple and compound fertilisers. To provide for the diversity of climatic and soil conditions represented by the above centres, an aggregate of thirty varieties of maize were tested, a selection being made to suit the conditions of each locality.

#### The Season.

The season commenced disastrously, the drought conditions of the winter of 1919 continuing through the spring and early summer and not breaking until the first week in January. Only in a very few localities was September planting possible, and light yields invariably resulted. Planting in October, November, and early December was accomplished chiefly after storms, and growth was slow until the heavy falls in the new year. The season was exceptionally good from January, and the late-sown plots yielded remarkably well. The trials sown on 26th November at Mr. Charles Oliver's, Casino, experienced exceedingly dry weather immediately after sowing, and the seed germinated so unevenly that it was considered advisable to cut the crop for green feed, it being impossible to obtain accurate results. The season was particularly adverse in the Richmond and Tweed River districts, slightly better in the Clarence, and still better in the Bellinger and Nambucca districts. On the Dorrigo the spring rains were below the average, but the drought conditions which prevailed on the coast were not in evidence on the plateau.

The precipitation for the growing period in each centre is shown in the following table:—

| — | Coraki. | Bellingen. | Kyogle. | Casino. | Lawrence. | North Dorrigo. | Dorrigo. | South Woodburn. | Camira Creek. | Burrapine. | Condong. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date of first record .. | 16 Nov., 1919. | 1 Dec., 1919. | 18 Nov., 1919. | 16 Jan., 1920. | 3 Jan., 1920. | 10 Oct., 1919. | 18 Oct., 1919. | 1 Nov., 1919. | 22 Nov., 1919. | 2 Dec., 1919. | 25 Nov., 1919. |
| 1919. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. | Pts. |
| October ... | ... | ... | ... | ... | ... | 248 | 47 | ... | ... | ... | ... |
| November ... | 62 | ... | 115 | ... | ... | 303 | 287 | 81 | ... | ... | ... |
| December ... | 121 | 402 | 244 | ... | ... | 486 | 507 | 174 | 250 | 428 | 320 |
| 1920. | | | | | | | | | | | |
| January ... | 1,034½ | 1,425 | 1,300 | 257 | 490 | 1,368 | 1,296 | 814 | 631 | 856 | 1,051 |
| February ... | 464 | 697 | 284 | 284 | 225 | 919 | 937 | 377 | 211 | 450½ | 455 |
| March... ... | 439 | 561 | 210 | 451 | 308 | ... | ... | ... | 321 | 423½ | 480 |
| April ... ... | ... | 516 | .. | 258 | 225 | ... | ... | ... | 205 | 295 | 396 |
| May ... ... | ... | ... | ... | 498 | 291 | ... | ... | ... | ... | ... | ... |
| Total ... | 2,120½ | 3,601 | 2,153 | [illegible],748 | 1,539 | 3,324 | 3,074 | 1,446 | 1,618 | 2 453 | 2,702 |

## Cultural Notes and Comments.

*Coraki.*—The soil is an alluvial loam typical of the Richmond around Coraki, but low-lying and liable to flood. The previous crop was maize, and the soil was reduced to an excellent tilth with one ploughing, two disc harrowings, and one tine harrowing.

The seed, Improved Yellow Dent, was planted 3 inches deep to ensure it being in a moist seed-bed and because of the drought conditions prevailing at sowing. The germination of the plots was most satisfactory. The growth to the end of December was slow, but with the continuous rain in January and February it became exceedingly luxuriant, and the subsequent yields of grain were very high. The results obtained were so erratic that they form no useful guide as to the best fertiliser for maize in the district. Irregularities in the soil which were not markedly apparent at the time of planting were so accentuated by the season that the results cannot be regarded as reliable.

*Bellingen.*—The site of these experiments was a fertile alluvial loam typical of the best lands of the Bellinger River. It has been growing maize continuously for forty years without the use of fertilisers of any kind. It was ploughed on 27th October, harrowed, rolled, and cross-harrowed on 29th October, reploughed on 24th November, twice harrowed, drilled, and planted on 8th December. The soil was moist and in excellent condition, and the plots germinated excellently, and made very satisfactory progress, eventually yielding remarkably well. The crop was cultivated with the Planet Jr. on 22nd December and 10th January, hilled and middled on 12th January, and harvested on 19th to 23rd July. The yields, it will be noted,

show a gradual increase with fertilisers, P7, with a yield of 107 bushels, being 22 bushels per acre better than the unmanured plot. Payable increases were obtained from all fertilisers except ground limestone.

This experiment is of particular interest in respect of many of our rich maize lands that have been growing maize continuously without artificial fertilisers for many years. It demonstrates that, although the depletion of fertility is so slow that it may take years before maize cannot be profitably grown, the application of artificial fertilisers results in substantially increased yields and less depletion of the soil's fertility.

MAIZE Variety Trials.

| — | F. Giblin, Burrapine | Wm. Barnes, South Woodburn. | E. Green, Kyogle. | E. Amps, Camira Creek. | G. P. Collins, Casino. | Mrs. F. Johnson, Coudong. | H. Short, Dorrigo. |
|---|---|---|---|---|---|---|---|
| Date sown. | 4th Dec., 1919. | 30th Oct., 1919. | 18th Nov., 1919. | 22nd Nov., 1919. | 16th Jan., 1920. | 25th Nov., 1919. | 18th Oct., 1919. |
| | bushels. | bushels. | bushels. | bushels | bushels. | bushels. | bushels. |
| Improved Yellow Dent .. | 67½ | .. | 81 | ... | 85½ | 40½ | ... |
| Golden Superb ... ... ... | 64 | 36 | ... | 29 | ... | ... | 52¼ |
| Yellow Hogan ... ... .. | 63¼ | ... | ... | 25 | ... | ... | ... |
| Leaming ... ... ... | 63 | 41 | 86 | 30 | 58 | 38½ | 63 |
| Golden Nugget ... .. | 58¾ | ... | 68 | 27 | 63½ | 35 | 61 |
| White-cap Horsetooth ... | 57½ | ... | 78 | .. | 83 | 41 | ... |
| Narrow Hogan... ... ... | 56 | ... | 79½ | ... | ... | 33¾ | ... |
| Kansas Sunflower ... ... | 53¾ | ... | ... | .. | ... | ... | ... |
| Red Hogan ... ... ... | 52½ | ... | 77 | ... | ... | ... | ... |
| Early Clarence... ... ... | 48 | ... | ... | ... | ... | ... | ... |
| Hickory King ... ... .. | 47¼ | 41½ | .. | 28½ | 63 | 45 | 49 |
| Yellow Mastodon ... ... | 46¼ | ... | 49 | 37 | ... | 29 | 21 |
| Gold Standard Leaming .. | 42½ | ... | 76½ | 31 | ... | ... | ... |
| Eureka ... ... ... ... | 41 | ... | ... | ... | ... | 31 | ... |
| Golden King ... ... ... | 39½ | ... | .. | ... | ... | ... | ... |
| Early Yellow Dent ... ... | ... | 53 | ... | 26 | ... | .. | 23 |
| Silvermine (Manning River)... | ... | 50 | ... | ... | ... | ... | 43 |
| Goldmine ... ... ... | ... | 37½ | ... | ... | ... | ... | ... |
| Golden Glow ... ... ... | ... | 37 | ... | ... | ... | ... | 32 |
| Golden Beauty... ... ... | ... | 34 | .. | . | ... | ... | ... |
| Leggett's Pride ... ... | ... | 33½ | ... | 25 | ... | ... | 25 |
| Silvermine (Yanco) ... ... | ... | 31½ | ... | ... | ... | ... | 29 |
| U. S. 133 ... ... ... | ... | 31 | ... | ... | ... | ... | 30 |
| Giant White ... ... ... | ... | ... | 71½ | ... | ... | 36½ | 38½ |
| Boone County White .. ... | ... | ... | ... | ... | ... | 44 | ... |
| Small Hogan ... .. ... | ... | ... | ... | ... | 61 | ... | 60½ |
| Large Macleay Yellow ... | ... | ... | ... | ... | 49 | ... | ... |
| Canada Early Flint ... ... | ... | .. | ... | ... | .. | ... | 39 |
| King of the Earlies ... ... | ... | ... | ... | ... | ... | ... | 41 |
| Silver King ... ... ... | ... | ... | ... | ... | ... | .. | 28 |

*Lawrence.*—The experiments were sown on a clay loam soil of medium fertility. The previous crop, oats and vetches, was fed to stock and then allowed to grow a foot high and ploughed under. The first ploughing was on 20th September, and the second on 10th December. The ground was left in its rough state until heavy rain fell on 28th December, when it was harrowed as soon as it was dry enough and planted on 3rd January. The

growth of stalk was exceptionally luxuriant, the season being particularly favourable to late-sown maize. The moist weather and excessive growth caused lodging, and the percentage of damaged maize was fairly high. The plots were scuffled on 12th and 22nd January, hilled on 31st January, and middled on 3rd February. The results are consistent with trials sown on the same date the previous season.

MAIZE Fertiliser Trials.

| | R. W. Hindmarsh, Bellingen. | Geo Forrest, Coraki. | E. N. Mackinnon, Lawrence. | A. Menzies, North Dorrigo. | G. P. Collins, Casino. | E. Amps, Camira Creek. | E. A. Green, The Risk, Kyogle. |
|---|---|---|---|---|---|---|---|
| Date sown. | 8th Dec., 1919. | 27th Nov., 1919. | 3rd Jan., 1920. | 10th Oct., 1919. | 16th Jan., 1920. | 22nd Nov., 1919. | 18th Nov., 1919. |
| Variety sown. | Improved Yellow Dent. | Improved Yellow Dent. | Improved Yellow Dent. | Leaming. | Improved Yellow Dent. | Hickory King. | Improved Yellow Dent. |
| | bushels per acre. | bushels per acre. | bushels per acre. | bushels per acre. | bushels per acre. | bushels per acre. | bushels per acre. |
| P7, 2 cwt. per acre .. | 107 | 79¾ | 101 | 54½ | 79¾ | 30 | 68 |
| P8, 2 ,, ,, .. | 99½ | 96 | 92¼ | 50 | 88 | 35½ | 74 |
| Superphosphate, 2 cwt. per acre .. .. | 98⅓ | 72¼ | 98¾ | 53¾ | 80 | 34 | 72 |
| M5, 1½ cwt. per acre .. | 95¼ | 86¼ | 95¾ | 52½ | 79½ | 20½ | 70 |
| Blood and bone, 2 cwt. per acre .. .. | 93 | 109 | 92 | .. | 88½ | 31 | 73 |
| Superphosphate, 1 cwt. per acre .. .. | 90½ | 96½ | 91½ | 53 | 98½ | 29½ | 61 |
| Ground limestone, 10 cwt. per acre .. | 85¾ | .. | .. | 52 | .. | .. | .. |
| No manure .. .. | 85 | 94¼ | 88¾ | 51 | 85½ | 10½ | 77½ |
| Approximate cost of applying best fertiliser .. .. .. | £ s. d. 1 1 0 | £ s. d. 1 3 0 | £ s. d. 0 19 3 | £ s. d. 1 2 0 | £ s. d. 0 9 0 | £ s. d. 1 2 0 | .. |
| Increase over unmanured at 8s. per bushel .. | £ s. d. 7 15 0 | £ s. d. 4 15 0 | £ s. d. 3 18 9 | £ s. d. 0 6 0 | £ s. d. 4 15 0 | £ s. d. 8 18 0 | Nil. |

The fertiliser mixtures were made up as follows:—
P7 = Equal parts superphosphate and bonedust.
P8 = Equal parts superphosphate and blood and bone.
M5 = Two parts superphosphate and one sulphate of ammonia.

*North Dorrigo.*—The soil is red volcanic, of porous nature, and typical of the best land on the plateau. It was reduced to an excellent tilth by two ploughings and harrowings, and was sown on 10th October. After-cultivation consisted of scuffling on 1st November and 2nd December. The soil was moist at sowing time, and the germination excellent. The growth of the plots was most satisfactory, and the unmanured plot seemed very backward right from the commencement. It was thought that the differences in yield would be greater than they actually proved to be, the biggest increase being only 3½ bushels with 2 cwt. of P7 to the acre, and the plots generally showed very little difference as a result of manurial treatment. In previous years the results have been more marked, and further trials will show whether the high cost of applying fertiliser to Dorrigo soils (owing to its isolation) is warranted.

"*The Risk,*" *Kyogle.*—The experiments in this centre were conducted on deep, rich, black alluvial loam that is particularly adapted for maize growing. The season was not so severe as on the rest of the Richmond,

and some excellent yields were obtained in the district. The sowing was made on 18th November. The previous crop was maize, the stalks of which were raked up and burnt, and the ground ploughed twice at intervals of two months to prepare it for sowing.

Results were very uniform, no increase resulting from use of artificial fertilisers. It was hardly to be expected that manures would be of benefit in this locality, the soil being among the richest in the State, and practically only newly cultivated. In the variety trial Leaming and Improved Yellow Dent again proved the highest yielders. Red Hogan, which always does well in this locality, proved inferior to those varieties, and was also defeated by Yellow Red Hogan and White-cap Horsetooth.

*Fairy Hill, Casino.*—The trials were sown on 16th January on a dark volcanic loam which had been ploughed twice and harrowed several times in preparation for sowing. The after-cultivation consisted of two workings with the disc-hiller. All the varieties were slightly affected with leaf blight, Hickory King and Small Hogan being particularly bad. The yields were remarkably good for such a late sowing. Several of the varieties were late season ones, which did not fully develop before winter, and gave much reduced yields in consequence. Improved Yellow Dent and White-cap Horsetooth gave by far the best results, while Leaming, which usually gives excellent results, gave a poor return owing chiefly to poor germination.

*South Woodburn.*—The soil here is a light grey sand of low fertility, but typical of a large area in the locality. The experiment consisted of a trial of varieties which were fertilised with P7 at 2 cwt. per acre. Very early varieties were tested, and the yields obtained were high for this centre. The ground was in good tilth, and the germination was very satisfactory. The varieties recently imported from the United States (Golden Glow, U.S. 133, and Golden Superb) yielded very well, but were easily out-yielded by Early Yellow Dent and Manning River Silvermine, which, considering the low quality of the soil, gave very creditable results. The climate and soil of the locality favours early maturing varieties, and in this particular it was noted that U.S. 133 matured in three months, Golden Glow a week later, and Early Yellow Dent three weeks later still. It will be interesting to observe whether in subsequent trials any of the varieties mentioned above will supplant Leaming and Hickory King, which have consistently held the premier positions in previous variety trials in this locality.

*Burrapine.*—The alluvial flats of Upper Taylor's Arm are only small in area, but they are of high fertility. The trials conducted at Burrapine were sown on a typical flat on 4th and 5th December. The soil was in good condition, being once ploughed and harrowed, after a winter fodder crop of wheat and oats, which was taken off in October. The germination was excellent, a fall of 201 points a few days before planting making it very moist at seeding time. Leaf blight was very severe on Eureka, Yellow Mastodon, Gold Standard Leaming, and Early Clarence, absent on Improved Yellow Dent, Golden Superb, and Yellow Hogan, and only slight on the

remaining varieties. A very severe wind and rainstorm during the first week in April played havoc with the plots, causing severe lodging, and considerable loss from moulding, etc.

This is the first trial of varieties in this centre, and it is interesting to note the success of Improved Yellow Dent, the variety which seems so suited to the coast generally, and particularly on alluvial river flats such as this. Golden Superb, which was only 9 feet in height, and by far the shortest of all, gave the second highest yield. Leaming and Yellow Hogan also yielded well, and will be watched with interest in succeeding trials. It is likely that resistance to leaf blight will be the deciding factor in this centre, where the disease is normally very prevalent.

*Camira Creek.*—The soil at this centre is a sand of poor quality, on which maize growing without fertilisers is not successful. A trial of varieties suited to poor land was sown and fertilised with P7 at 1½ cwt. per acre. The ground was ploughed early in the winter and allowed to remain without further cultivation until 17th November, when it was cross-ploughed and harrowed twice, sowing taking place on 22nd November. The plots germinated well. In the fertiliser trial with Hickory King the difference between the two unmanured plots and those that had been fertilised was remarkable. According to field notes taken on 17th February, the plot fertilised with P8 appeared to be the best, showing an excellent colour and a height of 8 feet. The other fertilised plots ranged from 7 feet to 7 feet 6 inches in height, while the unmanured were only 3 feet 6 inches high with very few ears setting. The ultimate yields of grain showed an increase of 25 bushels per acre for P8 over the unmanured plots, and very substantial increases with all fertilisers, the worst, M5, showing an increase of 10 bushels. This is not to be wondered at, the soil being of poor quality; it demonstrates clearly that payable crops can be obtained on such soils with the addition of fertilisers.

It is interesting to note the behaviour of varieties. Hickory King and Leaming have always given the best results, but it appears that Yellow Mastodon and Gold Standard Leaming, which have not been tried previously, are likely to rival them in yield.

*Condong.*—The experiment was sown on 25th November in a heavy black loam which was originally swamp land, and of which there is a considerable area behind the alluvial banks of the Tweed River. The usual preparation was given for sowing, and the seed was dropped by hand in drills 4 feet apart. The germination was excellent, and the after-cultivation consisted of two scufflings in December and hilling on 15th March.

The rainfall was excessive from January, and the ground being low-lying, the crop suffered from a surfeit of moisture, which lowered the yields considerably. The results were in favour of the white varieties, Hickory King and Boone County White apparently being the most suitable. This, however, being the first series of experiments in this centre, definite conclusions cannot be drawn until an accumulation of evidence is available.

*Dorrigo.*—A site typical of the volcanic soil of the plateau was sown with sixteen very early varieties on 17th October, 1918, in drills 4 feet

6 inches apart. The previous crop was maize, and the soil was ploughed once only in preparation for the trial. The seed was sown by hand, three grains every 2 feet 6 inches, and no fertiliser was employed. The season being a remarkably good one, the growth was very good and the yields slightly above normal. Leaf blight made its appearance, being particularly severe on Silver King, Yanco Silvermine, and Early Yellow Dent, as reflected in the yields of grain. Golden Superb, which occupied first place in last season's trial, was defeated by three others. Leaming, which last season occupied second place, gave the highest yield, and appears to be the most consistent variety. Its most serious rival on the plateau will most likely be Small Red Hogan, which occupied third place and gave an excellent yield in a pure seed plot of three or four acres. The yield of 61 bushels obtained from Golden Nugget was unexpected, and although later than Leaming, it may prove adapted to the soil and climate, its resistance to leaf blight being in its favour.

## *Melilotus* spp. as a Green Manure Crop.

*Melilotus alba* (Bokhara clover) is being grown at many of our experiment farms, and does fairly well everywhere, but particularly so at Glen Innes. In my opinion it is the best all-round legume yet tried at Glen Innes, and I consider it would do splendidly as a green manure crop in the orchard there. It is a biennial, however, and makes its best growth during the second year, so that it is most suitable for young orchards where little interference with the trees is necessary.

I would not recommend *Melilotus indica* (Hexham Scent) to be grown anywhere for this purpose, as it is not a good fodder plant, and owing to the rapid manner in which it spreads, particularly in lucerne fields, is likely to become a pest. Field peas are better than Hexham Scent as a green manure crop.—E. Breakwell, Agrostologist.

## The Eradication of Weeds.

Losses of stock from time to time in the Muswellbrook, Scone, and Denman districts, have directed the attention of pastoralists to the plant familiar to many of them as the poison tulip (*Homeria collina*)—a weed with known toxic properties—but efforts at eradication have been somewhat isolated and intermittent. Recent losses have again given it some importance, and the Upper Hunter and Muswellbrook Shire Councils have proclaimed the plant a noxious weed within their boundaries, and have intimated their intention to compel its eradication.

The action is in the right direction. Mere proclamation of a weed will be of little value. Enforcement of eradication, though often regarded as a hardship, is really in the interests of all stock-owners in any district where a poisonous weed is permitted to get a footing.—The Veterinary Officers of the Stock Branch.

## Pure-seed Growers Recommended by the Department.

The following list of growers of pure seed of different varieties of farm crops is compiled to indicate to farmers where pure seed is at present available. The list is compiled on recommendations made after an inspection by a field officer of the Department.

| | |
|---|---|
| ***Maize*** :— | |
| Silver King (ungraded) ... | ... A. Sommerlad, Hillcrest, Tenterfield. |
| Early Yellow Dent ... | ... Manager, Experiment Farm, Glen Innes.<br>J. S. R. Crawford, Emu Swamp, Orange. |
| Silvermine ... ... ... | ... Manager, Experiment Farm, Yanco. |
| Small Red Hogan... ... | ... H. Short, Dorrigo. |
| Craig Mitchell (ungraded) | ... W. D. K. Humphries, Muswellbrook. |
| Boone County White ... | ... J. Chittick, Kangaroo Valley. |
| Golden Beauty .. ... | ... R. Richardson, Mondrook, Tinonee. |
| Leaming ... ... ... | ... Manager, Experiment Farm, Grafton. |
| Golden Nugget ... ... | ... J. W. Smith, Wauchope. |
| Early Clarence ... ... | ... F. T. Dowling, Tumut. |
| Giant or Manning White | ... A. McM. Singleton, Henley, Sydney. |
| Improved Yellow Dent ... | ... Manager, Experiment Farm, Grafton. |
| Red Hogan... ... .. | .. Principal, Hawkesbury A. College, Richmond. |
| ***Grain Sorghums*** :— | |
| Feterita ... . ... | ... W. W. Hosking, Farm 778, Leeton. |
| ***Sweet or Saccharine Sorghums*** :— | |
| Saccaline ... ... ... | ... Manager, Experiment Farm, Lismore. |
| ***Grasses*** :— | |
| Paspalum ... ... ... | ... Manager, Experiment Farm, Lismore. |
| ,, .. ... ... | ... Manager, Experiment Farm, Berry. |
| Sudan Grass ... ... | ... W. W. Hosking, Farm 778, Leeton. |
| *Elephant Grass* (roots or cuttings) | ... Principal, Hawkesbury A. College, Richmond<br>Manager, Experiment Farm, Grafton.<br>Manager, Experiment Farm, Lismore.<br>Manager, Experiment Farm, Yanco. |
| *Kikuyu Grass* (roots) ... ... | ... Principal, Hawkesbury A. College, Richmond. |
| ***Clovers*** :— | |
| Shearman's Clover (roots) | ... J. H. Shearman, Fullerton Cove, Stockton, *via* Newcastle. |
| Bokhara or Sweet Clover | ... A. Sommerlad, Hillcrest, Tenterfield. |

Growers of pure seed of any variety of farm crop who wish to be included in this list should communicate with the Under Secretary, Department of Agriculture, Sydney.

It is especially desired to locate reliable sources of seed of Thew, Huguenot, Firbank, and Florence wheats, Sunrise, Ruakura, and Guyra oats, and Cape and Skinless barleys, the demand for seed of which for coastal green fodder far exceeds the visible supply.

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## "Vegetable Growing in New South Wales."

A book of 137 pages with the above title is in the press, and should be available shortly. It is intended to be of use to small market gardeners and suburban residents, covering the propagation and cultivation of a large number of popular vegetables, and dealing very thoroughly with diseases and pests and their control. Price, 2s. 6d., postage twopence extra; obtainable from the Government Printer, Sydney.

# Diseases of Bees in New South Wales.

W. A. GOODACRE, Senior Apiary Inspector.

MODERN methods of hive management allow of the observation of the bees, and have made it possible for the scientist and practical apiarist to investigate disease. A great deal of work of vital importance to bee-farmers has thus been carried out, so that even the beginner can enter the business to-day with some assurance that if he is observant and uses up-to-date methods of management the risk that he will be put out of the business by disease is small. A habit of observation, use of modern material, and a determination to keep in line with the latest methods of management will go far to prevent outbreak and spread of disease, and although there will certainly be times when the most competent apiarist will have his colonies affected with some trouble, he will at least have the satisfaction of knowing that he can usually trace it to an outside source. Principally such trouble will be brood disease, for this is easily passed on from a careless or incompetent bee-keeping neighbour. Where such a cause is suspected, the interested apiarist should report the matter to the Department of Agriculture at once, when inspection will be made of the locality.

Every bee-farmer should be thoroughly acquainted with the symptoms of all serious diseases of bees. The beginner at times finds suspicious matter giving the idea that disease is present and it is always wise to take the precautions necessary to prevent the spread of disease where there is any suspicion of its presence. This done, a scientific diagnosis of any trouble should be obtained by forwarding a sample of doubtful matter to the Department for biological examination. The subject of forwarding samples of brood and bees will be dealt with later.

The diseases that affect colonies of bees are of two forms—those that affect the brood and those that affect the adult bee. Definite diagnoses and sound and practical recommendations for treatment of the firstmentioned have been made by various investigators; but, although considerable attention has been given to the diseases of the adult bee, equally definite diagnoses has not yet been found possible, and the matter of their treatment is still somewhat obscure. If care is taken, however, and the treatment advocated is given, serious losses can usually be avoided. Most apiarists have some trouble with adult bee disease, but it rarely, if ever, comes in the form of a serious epidemic.

### American Foul Brood (*Bacillus larvæ*).

The name "foul brood" is in itself expressive. In this disease the brood, when in an advanced stage, has a foul or offensive odour: the prefix "American" is to distinguish it from other foul brood. The cause of the disease is the organism *Bacillus larvæ,* which finds suitable media in which to thrive in bee larvæ. When it is recognised that thousands of spores from

which the organism is produced are in a minute particle of diseased matter and that the disease is contagious, the reader will appreciate the necessity of prompt and correct treatment of affected colonies. It should be remembered, too, that the spores of *Bacillus larvæ* can remain inactive in honey and, under certain conditions, about hive material. The treatment presently to be described provides for the elimination of all contagious matter.

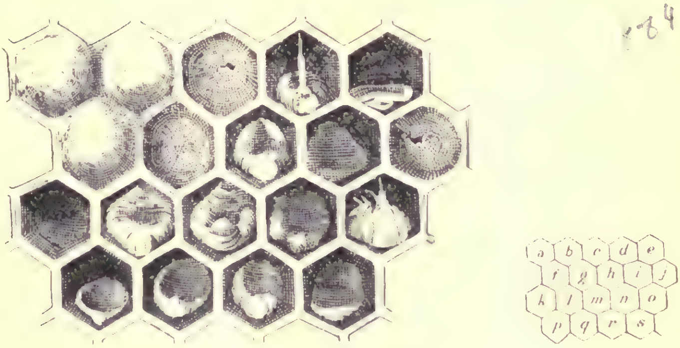
All beginners should endeavour to obtain a thorough knowledge of the appearance of the brood and brood combs of healthy brood nests. This will enable prompt detection of symptoms of disease. If foul brood is present in other apiaries in the locality, particular care should be taken, even if the disease cannot be discovered in one's own. The chief characteristic of the disease is the ropiness of the diseased matter, and when suspicious matter is found it should always be thoroughly tested for ropiness as described and illustrated later. If the disease is in an advanced stage an offensive gluepot odour will invariably be noticed. Dull and perforated cappings on the brood are signs significant of this disease, and immediately call for further investigation. It is specially noticeable that the majority of larvæ attacked by this disease die after being sealed in the cells.

### Symptoms.

(1) *Discoloured, Sunken, and Perforated Cappings on the Brood.*—These three suspicious signs are considered together to save confusion and perhaps wrongful suspicion. Examination of a comb containing brood affected with American foul brood will show that the cappings on the cells containing the remains of the larvæ killed with the disease are sunken a little—in healthy brood they would be slightly convex in shape—the colour of the sunken cappings is darker in appearance than the healthy brood cappings and a large percentage have a small jagged puncture, probably torn in by the bees in their desire to investigate the abnormal condition. An apiarist with experience will detect the suspicious cappings in a comb which contains only a few diseased larvæ; the beginner will not be so keen, but if care is taken the suspicious signs may be detected at a fairly early stage. When the signs mentioned are found, the cappings of some of the suspected cells should be removed so that the more conclusive tests can be carried out. The healthy condition of what is known as "bare-headed brood" should not be mistaken for a suspicious sign; the cappings on the brood in this case are apparently sunken and perforated—not jagged—but the immature bee is sound and white.

(2) *Discoloured Larvæ.*—Larvæ in a healthy state are pearly white, but when killed with foul brood their colour turns to coffee brown, and they become shrunken and out of shape and lie on the bottom side of the cell.

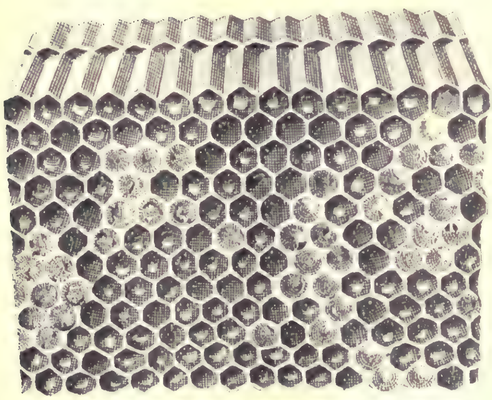
(3) *Ropiness of the Diseased Matter.*—The test for ropiness (or stringy characteristic) is considered conclusive. If the diseased remains of larvæ killed with foul brood are stirred in the cell with a fine-trimmed splinter of wood or piece of dry grass stalk and the instrument is withdrawn slowly, it will be found that portion of the diseased matter will adhere to it and "rope out" from ½ to 2 inches, as saliva would. Test for ropiness should




**American Foul Brood.**

*a.b.f.* normal sealed cells; *c.j.* sunken cappings, showing perforation; *g.* sunken capping, not perforated; *h.l.m.n.q.r.* larvæ affected by disease; *e.i.p.s.* scales formed from dried-down larvæ; *d.o.* pupæ affected by disease.
Twice natural size.

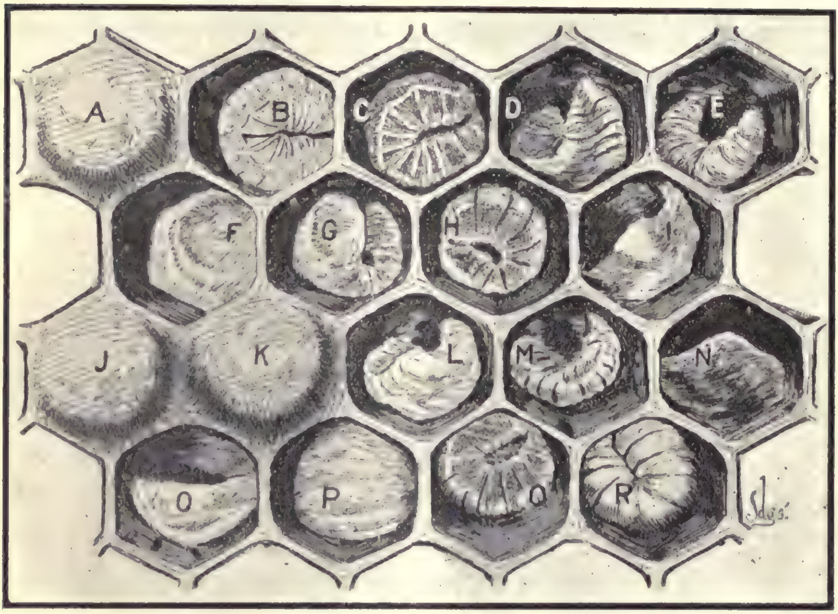
**The Ropiness of American Foul Brood.**



**American Foul Brood Comb, showing irregular patches of sunken cappings and scales.**

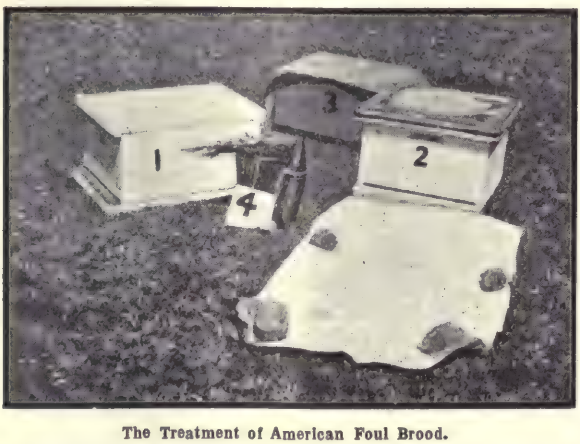
The position of the comb indicates the best way to view the scales.

[*Illustrations after Phillips.*]




**European Foul Brood.**

Portion of comb, showing effect of European foul brood upon the larvæ: A, J, K, normal sealed cells; B, C, D, E, G, I, L, M, P, Q, larvæ affected by disease; R, normal larva at age attacked by disease; F, H, N, O, dried-down larvæ or scales.—From F. B. 975, U.S. Department of Agriculture.




**The Treatment of American Foul Brood.**

1. A diseased hive removed from the stand.
2. A new hive placed on the stand, and sheet of paper adjusted.
3. Carrying box with bag cover.
4. Smoker and home-made brush.

be made from a number of diseased larvæ, and if there is any suspicion of disease the apiarist should at once take steps necessary to prevent its spread, and then forward a sample of the brood to the Department of Agriculture for examination.

(4) *Offensive Glue-pot Odour.*—This odour is very easily noticed when foul brood is in an advanced stage; otherwise, it can rarely be noticed. Bee-farmers should not, therefore, entirely depend upon the odour as a means to diagnosis, but should study all the symptoms, so that the disease may be detected before it reaches the advanced stage.

(5) *Dried Scales of American Foul brood.*—It will almost invariably be found that where bees occupy a diseased hive the previously mentioned symptoms will be present; but where colonies have died out from the effects of the disease, the remains of all dead larvæ will dry into scales on the bottom side of the cells. These dark-coloured scales can be detected if an

**The Government Apiary at Wauchope.**

infected comb is so held that light shines down the cells. To avoid the risk of having contagious matter such as combs that contain foul brood in this stage, beginners especially should attend to and immediately examine any hive that bees have deserted, or where bees have died out. Extreme care should also be taken to see that any suspicious material and any purchased material coming from an unknown source is thoroughly disinfected by boiling.

If the apiarist is observant and takes notice of the foregoing symptoms, any chance of confusing the disease with such conditions as chilled, starved, or over-heated brood should be practically eliminated. In the three conditions mentioned the dead larvæ are not diseased, and are usually of a dark-grey colour. Neither is the ropy characteristic present, and although there may in severe cases be a sour smell from the dead matter, the odour is not of the offensive glue-pot type.

## To Prevent the Spread of Disease.

When foul brood is found in a hive the entrance should be immediately contracted in such a way that only a few bees can pass out at one time. Any other cracks about the hive should be securely blocked up.

Honey from diseased hives is the chief source from which infection is spread; if, therefore, extreme care is exercised to prevent robbery from any diseased hive, the infection can, with care, in many cases be kept from spreading. Such care will include the disinfecting of the operator's hands and any implements used in the examination of infected hives, and the keen inspection of any combs interchanged with those of other colonies.

## Treatment.

So far as is known, it has never once been recorded that a colony infected with American foul brood has been freed from the disease without treatment. Where infection is slight it may take it considerable time to destroy the colony, but this it is sure to do eventually if treatment is not applied. Moreover, the infected colony is a constant menace (especially when the disease becomes advanced) to healthy stocks in the locality.

Treatment consists of removing the contagious matter (the complete hive, combs, &c.) and giving the bees a fresh start in a clean hive, the frames of which contain comb foundation (full sheets) only. It has been proved that by the time the bees have the foundation in the new hive built out, they will have used up any infected honey that may have been carried by them from the infected hive. The treatment is termed the "shaking or starvation treatment," although under certain conditions the same effect may be produced by a different manipulation of the colony, to be described later.

## Weakly Populated Hives.

If the infected colony is weak in population the bees should be destroyed. The following method will be found easy and effective:—Toward the late afternoon prepare a boiler and have the water boiling up well. When the bees have finished flying for the day, deliver a few puffs of smoke at the entrance of the infected hive, press into the entrance a wire cloth screen so as to prevent the bees getting out, place the hive—bees and all—in a sound sack, and immerse the whole in the boiling water. Twist about occasionally so that the hive parts will come apart in the sack and keep immersed in the boiling water for fifteen minutes; then open the sack and empty the contents into the water. Next take out the cover, bottom board, and body, and wash them separately in boiling water, weighting down the frames in the first receptacle, and allowing them to remain for a further fifteen minutes.

If in the first place the boiler is not large enough for complete immersion of the hive, make sure of killing the bees by twisting the hive about in the boiling water; then treat the hive parts separately, frames first. Unless there is a fair quantity of wax, it is not advisable to bother to save it; it is better to burn it with the refuse.

An alternative method for killing the bees is to blow sulphur fumes into the hive with the smoker. This operation is best carried out at night, a hole

being afterwards made in the ground, and the frames containing combs properly burned up. The other parts of the hive are scorched and afterwards immersed in boiling water for further surety.

### More Populous Hives.

For successful treatment of populous and fairly populous hives, a honey flow is necessary, and if at any time treatment is delayed through no flow being on, the precautions to prevent robbing in the meantime must be rigidly observed. The treatment, as already indicated, consists of the complete removal and separation of the bees from the infected hive. The procedure is as follows, and is best carried out after the bees have finished work for the day:—

The apiarist first makes ready (1) a clean hive (preferably a new one) with frames containing comb foundation only; (2) a carrying box, with sound bottom and a sack to act as cover; (3) a smoker; (4) a home-made brush; and (5) a boiler full of boiling water. The operation should take place, as in the case of the treatment already described, during the late afternoon, as soon as all the bees have finished work for the day. The infected colony is then lightly smoked, removed from its stand, and the newly-prepared hive, containing foundation only, set in the vacant position. A sound sheet of newspaper is next weighted down in front of and right up to the alighting board of the new hive, and any others in the close vicinity of the infected colony are screened so as to prevent drifting bees from entering.

The bees from the infected hive are then transferred to their clean quarters. The procedure is to open up the infected hive, remove the frames one at a time, and shake and brush some of the bees off the first frame right inside the clean hives, and all the remainder on to the newspaper in front of the clean hive. As each frame is cleared of bees it is put in the carrying box and the latter covered with a sack.

After the bees have been removed, the infected material should at once be taken to the boiler. The frames are first immersed in boiling water for thirty minutes, the wax and refuse skimmed off, and the other hive parts then immersed for a similar time. The carrying box and brush should be sterilised with boiling water or burned, and the newspaper used in the operation should also be burned. Before making use of any treated frames they should again be cleaned in boiling water. The other hive parts should be painted inside and out.

As soon as all the bees have entered the new hive, fasten up the entrance securely with wire cloth and remove the hive to any bee-proof room where they will not be interfered with. About dusk on the third day after treatment the hive should be returned to its stand, a little smoke delivered at the entrance, and the entrance screen removed.

Where a large number of colonies are to be treated at one time, the removal of the transferred colonies is not practicable, and a piece of excluder is neatly fitted on the entrance to minimise the risk of absconding.

### Late Autumn Treatment.

If the colony is weak, destroy the bees and disinfect by boiling the infected material. If the colony is populous and the disease not too far advanced transfer the bees to a clean hive in manner similar to that previously mentioned, except in so far that the new hive should contain frames of solid sealed honey. The transferred bees are left on the stand. The treatment must be carried out at the close of brood-raising.

In any case of foul brood the saving of honey cannot be advocated, for it often means the recurrence of the disease.

Do not attempt to treat diseased combs with chemical disinfectants only—such treatment has not proved successful.

### Brood for Examination.

When suspicious matter is to be forwarded to the Department for examination, a piece of brood comb about 4 or 5 inches square should be cut neatly from an undamaged portion of the brood only. The sample should be as free from honey as possible, should be packed securely in a tin box, and should be addressed "The Biologist, Department of Agriculture, Sydney." The sender's name and address should be plainly written on the packet, and a letter should be sent to the Under Secretary and Director, Department of Agriculture, stating that a sample of brood has been sent for examination.

(*To be continued.*)

## PIGEON PEA (*Cajanus indicus*).

PIGEON pea is a perennial summer legume that grows quickly and reaches a height of 6 or 7 feet at maturity. When young it carries a fair bulk of small leaves, but later becomes coarse and woody, and in warm climates produces a large number of pods containing three or four small seeds, which are easily scattered by the opening of the pods when mature. Though affected by light frosts, it makes growth quickly in the spring, and again bears seeds by the end of the summer. The seed is similar in appearance to the Grey field pea, which is in favour for pigeons, but which is only about half the size.

Only the young growth and the leaves are suitable for fodder, but the amount produced is not equal to that of other summer legumes. Perhaps the best use that can be made of the seed is to plant a hedge along a poultry or pigeon yard, and allow the seed to fall and be picked up by the birds. After seeding, the crop should be cut back to about half the height or less, and the same treatment given each time after maturity.

If sown in rows, these should be 3 or 3½ feet apart, and each seed 9 or 10 inches apart in the rows. Sowing should take place about October on the coast, to which part of the State it is best suited.

The plants have long, straight tap-roots, which open up a stiff soil, and when well established the plants are markedly drought resistant. Owing to the succulence of the young shoots and leaves (and their woodiness when old) the crop as fodder is best used for grazing. A fair crop of seed is from ½ ton to ¾ ton per acre.—H. WENHOLZ, Inspector of Agriculture.

# Chats about the Prickly Pear.

No 7.

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.,
Government Botanist, and Director, Botanic Gardens, Sydney.

## The Use of Poison and Poisoning Apparatus.

THIS aspect of the subject may be approached under the following headings:—

South African experience.
Arsenite of soda.
Other poisons.
Gas (*arsenious chloride*).
High-pressure steam.
Apparatus—Rollers, sprayers, injectors.
The Scone experiments of 1907-8.
Subsequent experiments.
A Competition suggested.

## South African Experience.

While there is a difference of opinion as to the economic value to the Australian stockowner of some kinds of prickly pear, there is no difference of opinion as to the desirability of having the destruction of species, especially the pest pear, as a principal end in view. I propose to give a brief outline of prickly pear destroyers.

In this *Gazette* for September, 1898, will be found valuable information in regard to pear destroyers, chiefly based on the experience of Mr. A. C. MacDonald, who conducted experiments for the Department of Agriculture of Cape Colony.

The advice there given to use arsenite of soda has been repeated by me to many persons during the last twenty-two years, and I believe it to be good advice on the whole.

In the Cape of Good Hope, experiments of a valuable character have been going forward ever since, and we can learn much from the experience of our South African friends.

In the Cape *Agricultural Journal* for 30th March, 1899 (Vol. XIV, p. 471), the Government regulations are stated for the *free* supply of "scrub exterminator for eradication of prickly pear" to owners or occupiers of land on which prickly pear is growing.

The result of supplying the exterminator free is thus stated:—

If there was ever a champion nest of prickly pear, exhibiting all the worst features of these over-run areas, it would be, perhaps, Cookhouse, on the Great Fish River. Many spasmodic efforts have been made to clear small open patches close to the drift, but most of these efforts were made simply by mechanical means, and with no intention to push the clearance beyond the immediate necessities of a garden. With the exterminator, however, and urged

by the increasing value of land, the proprietors have got rid of the pest wholesale, and large agricultural areas are now under the plough and carrying crops which had for fifty years been impenetrable thickets of the prickly pear.

Then, again, in what is termed the Perseverance Valley, between Port Elizabeth and Uitenhage, whole plots on farms have been cleared, and the profits consequently accruing are such as to make it pretty certain that the pest, once driven out, will never be allowed to return. Thus one might go on particularising place after place, but I hardly think this is necessary. The traveller by rail through the midlands can see for himself in every direction piles of the extirpated pear heaped up to rot and dry off, after having been killed by the exterminator; and for miles where the land used to be so thick with this plague that it could not carry stock, there is absolutely not a living prickly pear to be seen.—Cape *Agric. Journal*, October, 1899.

The free carriage on the railways of proprietary poisons for fighting the pest has been Queensland policy for a number of years. Arsenic (white arsenic or arsenic acid) is carried free on the railways to settlers if supplied by business people. The State also supplies arsenic from its own mines at £10 per ton, but this is not carried free on the railways because of its reduced price, and a statutory declaration is required that the supply is for treatment of pear-infested lands.

Free exterminator (poison) was supplied to owners of pear-infested land by the Cape Government for a number of years. Under the entirely exceptional nature of the problem, perhaps this might be considered in New South Wales.

In New South Wales caustic soda and arsenic declared to be for use in the destruction of prickly pear will be charged by the Railway Commissioners at "A" class rate, subject to a minimum of 10 cwt., on production of a certificate from the Under Secretary, Department of Lands.

In the Cape *Agricultural Journal* for November, 1906, will be found a brief history of the pest in South Africa, with incidental notes on Australian experience by Dr. Eric H. Nobbs. There is another paper by Dr. Nobbs in the same journal, December, 1907, entitled "Experiments upon the destruction of prickly pear, 1907. Final report." The experiments were with various preparations—the well-known arsenite of soda, together with other substances of ascertained composition, and a number of proprietary articles. Details of these experiments are given, and the comparative cost of materials for treating a specified area of pear is worked out. The following are extracts from the report:—

The arsenite of soda (Government exterminator) has in all three instances upheld its name as unquestionably efficacious, and may without further comment be written down as thoroughly successful. Satisfactory as it is to have this proof and assurance that in the past we have been working along right lines, yet it is to be regretted that none of the proprietary exterminators used have proved themselves superior to arsenite of soda, for at best it has to be admitted that the use of the Government exterminator in this manner is laborious, slow, and expensive. So much is this the case, indeed, that it can seldom prove immediately profitable, except on land intended for crops where the removal of the roots is in any event a necessary proceeding. Only exceptionally can this method prove feasible in the case of grazing land. Yet all the other methods tried, successful or not, were very much more costly than that with arsenite of soda. . . .

It would have been very pleasing had these comprehensive trials discovered an exterminator superior to the arsenite of soda in general use. Such, however, is not the case. The value of this material when used in methods additional to the customary way of spraying heaps has, however, been established,

and is deserving of attention, as the arduous process of stubbing is not always necessary or desirable. Other processes have shown themselves to be effective, and certain of them would, no doubt, come into use if the prices could be reduced to compare favourably with that of arsenite of soda, which, though distributed at cost price, cannot be regarded as a cheap commodity.

There appears to be some uncertainty as to the pest pear in South Africa. Dr. Marloth is quoted by Dr. Nobbs in his paper (Cape *Agricultural Journal*, November, 1906) as having said that the common pest pear "is either *Opuntia ficus-idica* or *O. tuna*." The former is not a pest anywhere, and what the latter species is no botanist can say with certainty.

There is another pest known in South Africa as "jointed cactus." This is known to botanists as *Opuntia pusilla*, which is another name for *O. aurantiaca*, figured with a coloured plate in this *Gazette* for 1911.

Then we come to a paper "Experiments upon the destruction of jointed cactus, 1907. Final report," by Dr. Nobbs (Cape *Agricultural Journal*, March, 1902). This "jointed cactus" (*Opuntia aurantiaca*) was observed in South Africa prior to 1874, and it is said to be "an even worse plague than the prickly pear."

This report is valuable and gives an account of spraying experiments with arsenite of soda and some proprietary remedies.

The results of the experiments, in great measure, only confirm and extend the conclusions already arrived at by the municipal authorities, who cleared practically the whole of the commonage, which two years ago was seriously infested, by spraying with a 4 per cent. solution of arsenite of soda. This was done at an average cost of £1 per morgen (a little over 2 acres) of cactus, which, though itself a large sum, is yet a cheap price to pay for the reclamation of so much valuable grazing land, which can henceforth be kept clean with a minimum of trouble.

Then an officer of the Cape Department of Agriculture reports on a proprietary exterminator in the Cape *Agricultural Journal*, March, 1910, the secret having been acquired by the Department. The method consisted of making incisions in the "leaves," and inserting a fluid poison made by compounding lime and sulphur with salt and arsenite of soda.

This cursory review of South African experience may conclude for the present with the following references to departmental reports on —

1. St. O'Gorman's Prickly Pear Exterminator (Cape *Agricultural Journal*, February, 1910).
2. Koen and Gouw's Prickly Pear Destroyer (Cape *Agricultural Journal*, June, 1910).
3. Destruction of Prickly Pear. South Africa *Agricultural Journal*, November, 1911.

Further information in regard to South African experience will be found at page 38 of the report of the Queensland Travelling Commission.

### Arsenite of Soda.

I have no doubt this substance has been used as a weed-killer before I was born, and all that I claim is to have advocated its use for many years in Australia, and I shall continue to do so (in its place) until I learn of a better.

With some experience of it on my private property, and subsequently in the Botanic Gardens and parks of Sydney, I drew particular attention to the valuable Cape Colony experiments of Mr. A. C. MacDonald with this substance. See this *Gazette,* September, 1898, p. 983. Subsequently Mr. Valder, then Principal of Hawkesbury Agricultural College (see this *Gazette,* January, 1902), used it for the eradication of pear locally, and other writers in the *Gazette* have also so used it or recommended it.

In an article entitled "Destruction of Prickly Pear with arsenical spray," in the Queensland *Agricultural Journal,* November, 1909, Mr. A. J. C. Brunnich writes:—

> Prepare a concentrate by mixing intimately, 10 lb. arsenic . . . . 3½ lb. caustic soda (75 per cent., the most economical form), and slowly and carefully add cold water to make 8 gallons of concentrate. The heat generated spontaneously by adding the water to the mixed dry chemicals is generally sufficient to dissolve all the arsenic, but should, after standing, some of the arsenic be found undissolved settled on the bottom of the drum, boiling of the concentrate for a few minutes will be necessary. . . .
>
> The 8 gallons of concentrate will make 100 gallons of spraying solution, which contains 1 oz. of arsenic in soluble form, by simply diluting with the necessary amount of water.

He also recommends the use of Stockholm tar, or coal tar or resin to enable the liquid to adhere more closely to the glaucous leaves of the pear.

A circular issued by Mr. Brunnich, under date 9th June, 1915, describes a dry powder (chiefly composed of common salt and arsenic) for injection into prickly pear, a concentrated solution of the same, also for injection, and a diluted solution for spraying the pear.

Both in New South Wales and Queensland men often carry a small bottle of arsenical sheep dip with them in their pocket, and when they see a small pear, they dismount from their horses, stick a pocket-knife in the pear and pour in a little dip. Much killing of single pear plants in paddocks has been brought about in this way.

In addition we have arsenical poison-mixtures in large numbers. It may in some cases be better to buy your own arsenic and make your own preparation. It seems fair to say that the most effective toxic agent known, so far as plant life is concerned, appears to be arsenic in one or other of its forms.

### Other Poisons.

Practically every cheap-selling poison available has also been tried in addition. If a man desires to patronise a proprietary he can easily make or procure an analysis to see if it is worth his while to purchase the article. There are differences of opinion in regard to many pear-poisons, and their merits cannot be assessed without a judicial inquiry, but it may be said that while "all poisons are good, some are better than others." Let not poisoning be relaxed simply because other experiments are afoot, but let it be borne in mind that, while any fool can kill pear, it takes a wise man to show a good balance-sheet.

### Gas (Arsenious chloride).

All liquid poisons (and to a greater extent those used in the solid or even deliquescent state) have the drawback that, whether applied in a finely divided state (as a spray) or without much propelling force, their action is usually more or less concentrated on the face on which the liquid is applied. In other words, only those plants are affected which receive the impact of the spray.

All sorts of liquids (usually solutions in water) have been tried, and valuable data have been secured as to their effectiveness and limitations. It was then interesting to find a new direction for research, that is, the aid of a gas called in—an all-pervading form of matter which would envelop the pear all round, would surround it in fact; would turn round the corners and let no portion, no face, of the pear escape contact with the poison. I refer to the use of arsenious chloride by an American chemist, Mr. A. C. Roberts, who operated chiefly in Queensland. This substance is a liquid (twice as heavy as water), but no water is used. By air pressure in the use of an atomizer, this liquid is converted into a gas, but this apparatus is chiefly used for scattered pear. When the pear is dense and over large areas a machine something like a tar-boiler is used and the gas evolved attacks acres of pear in a day. In the use of this apparatus the direction of the wind is studied, not only so that the gas may be guided where desired, but also to protect the operator. By the use of gas, gullies and broken country generally bearing pear, which cannot be tackled by the ordinary spraying apparatus, are dealt with. The method is still the subject of experiment.

### High Pressure Steam.

Mr. Will A. Dixon, in the newspapers of 26th February, 1904, advocated destruction of pear by high pressure steam.

## Queenless Colonies.

In any case where a colony becomes queenless, and no eggs nor young larvæ are present in the combs to give the colony a chance to raise another queen, such a colony will certainly die out, even if ample stores are available, because no young bees can be raised to take the place of the old bees. It occasionally happens that a queen dies during winter when no brood is in the hive, and in this case the bees have no chance of raising another queen If a queen dies during a time when progressive brood-raising is going on, the bees usually raise another queen from the very young worker larvæ. It happens in some cases that the young queen gets lost when taking her mating flight, thus leaving the colony queenless and without young brood from which another queen can be raised. The only chance in such cases is, in season, to introduce to the queenless colony a frame of brood containing eggs or very young larvæ, or to introduce a queen before the colony gets too weak.—W. A. Goodacre, Senior Apiary Inspector.

# The Cultivation of Flowers for Profit.

E. N. WARD, Superintendent, Botanic Gardens, Sydney.

THE growing of flowers for a living is a different proposition to the growing of flowers in the garden for occasional sale. The latter only means making one's garden in some measure pay for itself, but the former means the cultivation of a piece of land large enough to produce successions of flowers that will realise sufficient for the grower to live upon. For the cultivation of flowers for a living, the land should be not less than 1 acre in extent; the aspect must be a warm one, so that blooms may be produced in mid-winter; the soil must be of such quality that it is not necessary to continually manure it; and permanent stand-pipes for spray irrigation must be installed so that water may be automatically reticulated over the whole area, and the grower may be at liberty to devote the necessary time to cultivation and marketing. The grower must practise the most economical way of plant—not soil—feeding. This means liquid manuring, which necessitates the placing of several large tubs in convenient places over the area, so that when the plants need food the need may be quickly supplied. Quick means of communication with buyers (the florists of some large town or city) is also essential, and this implies the installation of a telephone.

If the produce is of good quality only, there is a market for any quantity. A few lines for which the soil and district are particularly suited are far better than a lot of mixtures. For instance, it would be much wiser to grow well one kind of carnation—growing it right through the winter until other growers are producing carnations without effort—than to grow many kinds indifferently. The Sydney suburbs are well suited for the production of carnations, roses, antirrhinums, asters, stocks, dahlias, Iceland poppies, and sweet peas, and it is better to grow these really well than to try to compete with growers in colder places in the production of violets, boronia, daffodils, and primroses.

As to culture—it is helpful to get into touch with more experienced growers and to question them on such subjects as deep cultivation, the feeding of the crop as distinct from the soil, and the advantages of good seed. If possible, join some nearby branch of the Agricultural Bureau, and discuss the problems there.

To grow flowers in the garden for occasional sale and to compete to this extent with those who depend entirely upon the growing of flowers for a living, means obviously that one must produce flowers of the highest quality, and even then there remains the task of finding a buyer. It is the regular grower upon whom florists depend: casual growers are only considered when they have something special to offer.

# Poultry Notes.

## December.

JAMES HADLINGTON, Poultry Expert.

A NOTICEABLE feature in all the districts visited recently is the comparatively small number of early hatched chickens on most of the farms. This is most unfortunate for individual farmers and for the industry generally. No doubt with many it has been a question of marketing eggs to obtain the necessary revenue to carry on, but it is to be feared that too many have succumbed to the depressing influences at work consequent upon the difficulty of obtaining food supplies and the high prices. This, together with the attractive prices offering for eggs during the early winter months, has been mainly responsible for the failure to hatch early chickens. As early as May last the advice given in these notes was "set eggs as usual" from 1st June, both light or heavy breeds. It was also pointed out that the extra value of eggs to be set then (say, 1½d. each) was not to be compared with the advantages to be gained by setting them at that time in order to secure early stock and the high prices that were likely to obtain. The soundness of this advice is now evident in the very high prices secured for table chickens right along the season, and will be still more so as the pullets of the early hatchings come on to lay. If properly handled, these pullets for the most part will continue to lay right along till April or, perhaps, May, thus providing eggs for three to five months while they are high in price, and assisting the poultry-keeper to feed and carry the first-year hens while in the moult. The August and early September pullets will then take up the running, while the June–July pullets are having a spell and, perhaps, going through a partial moult.

Right now is the time for the novice poultry-farmer to see this and learn this very important lesson.

### Another Lesson.

Another lesson might also be learnt at the same time by watching the results of very late hatchings. Recently I have found it necessary, in lectures and otherwise, to repeat the warning given some four or five years ago on this subject, and to combat strongly some advice that was being given to hatch right on through October, November, and December. I then said, "If you wish to fill your yards with diseased and unprofitable chickens, consequent upon mortality and bad development, hatch in those months; by refraining from doing so, much disappointment and unprofitable work will be escaped." That advice was not based upon theory or prejudice, as some would have farmers to believe, but upon sound experience, and it stands unaltered to-day.

The vision of high prices likely to be received for chickens hatched at that time must also fade away. The facts are that these late-hatched chickens

(or the survivors of them) come on to the market at a time when the "ne'er-do-wells" of the previous spring hatching are being marketed, which militates against high prices being obtained until about May. Even presuming that high prices are obtainable for these October, November, and December-hatched chickens, the wastage in rearing is mostly sufficient to make such rearing unprofitable.

But this is not all. The fact of chickens being run for so many months over the same ground without a break is the most serious feature of the practice, because continuous rearing over the same ground is conducive to the diseases (particularly coccidiosis) to which chickens are subject. Experience seems to indicate that this disease may get a start early in the season, and be in existence long before it is recognised or becomes a menace to the well-being and life of the chickens. In other words, the incidence of this disease appears to become cumulative as the season advances. In this factor will doubtless be found, to a very large extent, the reason why there is often a very much higher percentage of loss, and also why many chickens fail to do so well at the end of the season. We have only to bear in mind these facts to see the inadvisability of continuous hatching.

The question arises, then, is it possible to have a kind of catch-crop of chickens, without running too much risk of failure with the spring or main hatching season, as a result of the circumstances mentioned herein. The answer is, cease hatching at the end of September, clear the ground as the chickens become old enough, rest the pens, and expose them to the elements as much as possible. Then make a small hatching during February and March. Close down again in the same way—spelling the land as before. This procedure would work out in this way: Set eggs from 1st June to 9th September for the spring crop, and from the middle of January to the 1st March (two rounds of the incubators) for the autumn hatching. These chickens will come in in time to catch the high prices ruling for table poultry from May to August, when a portion of the main season hatchings will become available for sale. The extent to which the catch crop of chickens is advisable, if at all, will depend upon the facilities and circumstances existing on each farm. By far the best results in rearing are secured where only one hatching season is made.

### Coccidiosis.

As far as present knowledge is concerned, there is no cure for coccidiosis Therefore prevention becomes the only solution of the trouble. The best means of prevention is to rest the land over which chickens have been run for the season. The floors of brooder-houses where coccidiosis might be suspected should be sprayed at the end of the season with a solution of glycerine and formalin—4 ounces of each to the gallon of water. There is no necessity to spray the houses other than the floors, and as high up the wood work as excreta may be deposited. Digging up or cropping the yards is worse than useless as a means of cleaning the soil, because the organisms are then turned under and preserved, whereas if the surface is left undisturbed and exposed to the sun, rain and air, the organisms perish. Hence the

necessity of cleaning up once the chickens are off the yards and giving the surface full exposure to the weather. As a precautionary measure where serious sickness has occurred, it is a good plan to remove 3 or 4 inches of the surface of the small chicken-runs as soon as they are clear of stock, and to let stand until near the following season's rearing, when the earth should be replaced with fresh soil or sand, whichever is available.

### Prevention of Chicken-pox.

Last year warts, or more properly speaking chicken-pox, made its appearance somewhat earlier than usual, with the result that protective measures were not commenced sufficiently early to be effective in the early outbreaks. Experience proves that the protective measures advocated in these notes are effective in rendering growing stock to a large extent immune from the worst effects of this disease.

The method of protection consists in giving growing stock flowers of sulphur two or three times a week in the morning mash for about three weeks in succession, the quantity to use being a level tablespoonful to each fifty adult birds. Then give them Epsom salts in the drinking water at the rate of 1 oz. to the gallon for a like period. If these treatments are carried out alternately from January to April little fear of chicken-pox need be entertained. February, March, and April are the months in which it is most active in this State.

Owing to the different ages that have to be fed, there appears to be some misunderstanding in regard to regulating the quantity of sulphur to be given on an adult feed basis. This difficulty can be overcome if we take it that one bushel of pollard, bran, &c., forming the morning mash, will feed from 180 to 200 adults. It therefore works out roughly at a tablespoonful of sulphur to each 5 lb. of mash before being wetted.

## Coal Smoke and Fruit Trees.

Whether the fumes from coal fires are harmful to fruit trees was asked by a correspondent. He was living about a quarter of a mile from a large brick kiln, and had been trying to start an orchard, but the fumes from the kiln were killing all the big bush timber in the vicinity, and the fruit trees were not doing too well.

The presence of sulphur dioxide in the smoke can alone be held responsible for any injury done by such smoke. Coal contains a certain amount of sulphur and this, on burning, forms sulphur dioxide, but the quantity present in local coal is not large, and it is problematical whether the fumes given off are likely to have injurious effects. If, however, there were undoubted proof of injury it would not be advisable to continue the orchard as no remedial measures can be suggested.

An American investigator states that grain crops, which are most susceptible, are bleached by one part of sulphur dioxide in a million of air—a proportion that is not likely to be approached in ordinary coal smoke.—F. B. Guthrie.

# Orchard Notes.

## DECEMBER.

W. J. ALLEN and S. A. HOGG.

### Simple Directions for Drying Fruit.

IN districts where apricots are grown for drying and canning, some will be found ripe enough for handling this month. Hemskirk, Alsace, Moorpark, and Trevatt have been found among the most suitable varieties for preserving, either in cans or by drying. Other varieties known as French varieties, such as Louizet and Large Early Montgomet, although very attractive in appearance are not suitable for preserving. In selecting apricots for canning the fruit should be well covered, but firm; they should be graded, the stones removed, and care should be taken when packing in the tins that the grades are not mixed. A bulletin on the process of canning may be obtained from the Government Printer, Sydney (price tenpence, post free).

To make the best dried fruit, allow the apricots to hang on the tree until they are perfectly ripe, but not over-ripe; they should be capable of being cut in halves with a sharp knife and still retain their shape. When the fruit is fairly soft, pick it carefully into cases; this will, in all probability, necessitate going over the trees five or six times. As soon as possible, have the cases carted to the cutting-shed, where the fruit should be carefully and evenly cut in halves (not pulled apart) and the stones removed. Place evenly on the trays with the cut side up, and as soon as possible remove each tray to the fumigator, where it may remain with the door closed until the fumigator is sufficiently full to start the sulphur burning. This is of the utmost importance, as once the fruit has been cut it must not be exposed to either sun or wind.

When everything is ready, place sufficient sulphur or brimstone to fill the room with fumes for about three hours (from 1 lb. to 2½ lb., according to size of room), using 1 lb. sulphur to every 300 cubic ft. space; if possible, allow the fruit to remain in the sulphur-room from eight to ten or twelve hours, or until the cup is full of juice. It can then be taken out and placed, either in the sun, or in the evaporator, as the case may be, immediately; if in the evaporator, do not place the fruit in the hottest part to begin with, but gradually work from the cooler to the hotter part, starting, say, at that part which is 100 degrees, and finishing off at 120 degrees Fah. In this way the fruit will dry in from fourteen to eighteen hours; but the greatest care must be taken not to allow it to burn. Some practice will be required to tell when it is just dry enough.

If the fruit is to be dried in the sun, use wooden trays 2 feet x 3 feet, which are made for the purpose, with a 2½ inch cleat at both ends. These are easily handled, and can be used in connection with all fruits.

In cutting the fruit and placing it on the trays, place it on the top part, or so that the cleats at the ends will be resting on the ground, thus allowing a current of air to pass underneath and assist in the drying process. If the weather is hot, as it usually is about Christmas time, it will take from two and a half to three and a half days to dry the fruit, which will require to be sorted over so that any which is not quite dry may be put on trays and allowed to stand for another half-day or so. The dried fruit should be taken from the trays and put immediately into clean calico bags, and securely tied so that the moths may not reach it.

When sorting over in the above manner, any fruit which is small or of bad appearance should not be mixed up with the good, but sorted out and marked as inferior, while the good also can be marked accordingly. When the fruit is dried and bagged, it should be at once stored in a cool, dry place; if exposed to heat it will become hard, lose in weight, and deteriorate in quality.

### Irrigation and Cultivation.

In the drier districts, where irrigation is practised, it will be found necessary to water all trees, vines, lucerne, or any other crops this month. Be sure to work up the ground as soon as it is dry enough to allow the horse and cultivator on the land.

All orchard land should be kept free from weeds, and to accomplish this the horse and cultivator should have but little rest this month, as an orchard that is neglected for a few days, will soon have a coating of summer grass, which will take many a hard day's work to eradicate; and couch grass spreads rapidly when left undisturbed. Where there are bad patches of couch grass, they should be ploughed up and harrowed on a very hot day, as the roots die when exposed to the sun.

Passion-vines which have been properly pruned and manured during November will now be putting on good growth and blooming freely. This fruit will be ready to meet the demand at Easter, when it usually finds a ready sale at good prices.

### Various Pests and Diseases.

Keep a strict lookout for pests, and if trees have not been fumigated or sprayed, as the case may be, lose no time before beginning to fight them.

For scales on citrus trees, December, January and February are good months for either spraying or fumigating; but for fungus diseases it is generally best to spray once before the trees bloom, and again as soon as the fruit has set, rather than to leave it until now. In many cases, however, later sprayings are both beneficial and necessary. The grower shou'd not neglect either to fumigate or spray all citrus trees, so as to secure clean fruit and healthy trees.

With regard to apples and pears, this season there is promise of a very heavy crop, and if there has not been a heavy natural fall by the end of November the fruit should be thinned, as there is no demand for small fruit on the market, and, apart from the smallness of the fruit, there is a great

likelihood of the major portion being destroyed by codlin moth, as it is next to impossible to spray thoroughly all the fruit when apples and pears are growing in clusters. It is essential from every point of view, therefore, that the fruit should be thinned out. If a very heavy crop of fruit is left on a tree there is a tendency to exhaust the tree, and, not only will the result be inferior fruit, but probably a failure on the part of the tree to produce next season.

Do not neglect spraying with arsenate of lead. Many of our late varieties of apples are destroyed by the codlin moth through failure to give late applications of arsenate; this has been very noticeable in such late varieties as Granny Smith.

If fruit-fly should make its appearance, all infested fruit should be destroyed, so as to assist, as far as possible, in keeping this pest in check.

### Vines.

As the past season has been wet, followed by showers during the spring, it is very probable that such fungus diseases as black spot and downy mildew will be prevalent. Downy mildew, unfortunately, only makes its presence known about the time when the vines are blossoming or the fruit is just set. When this disease is detected immediate steps should be taken to spray, using Bordeaux mixture at summer strength. It may be necessary, if weather conditions are favourable for the production of these fungus spores, to continue spraying until the crops are ready for harvesting.

### Tropical Fruit.

In tropical districts pineapples may be planted if moist weather prevails. Suckers are the best to plant, being much the strongest and earliest to arrive at maturity. Being great feeders, a dressing of strong nitrogenous fertiliser will promote rapid growth and fine fruit. While the plants are young, cultivation must be thorough, but not deep enough to cut the feeding roots which are near the surface.

Bananas and other tropical fruits may also be planted during the rainy season.

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## Seed Maize and Birds.

A farmer who suffers a good deal by the depredations of crows and parrots among young maize, informed the Department lately that he always coated his seed maize with a mixture consisting of 1 pint coal tar and 1 pint hot water to 1 bushel of seed. He wished to know if his method were sound.

He was informed, in reply, that the method was quite effective. After treatment, the seed can be dusted with lime or dust to dry it for sowing by machine.

Another method of protecting a field of young maize is thoroughly to soak or boil a quantity of maize grain, and to add about $\frac{1}{4}$ oz. strychnine or 1 lb. arsenic to a kerosene tin of swollen maize. Scatter the grain thinly over the field.—H. Wenholz, Inspector of Agriculture.

# Agricultural Bureau of New South Wales.

## SUGGESTED SUBJECTS FOR BUREAU MEETINGS.

It sometimes happens that, owing to some inadvertence, members of branches meet without having any particular subject before them. In such a case one of the following paragraphs may provoke a useful discussion, and a brief report of the discussion will often interest other branches.

*What relative values do you attach to sheep on the farm* (*a*) *as scavengers,* (*b*) *as sweeteners of the soil,* (*c*) *as direct profit earners?*

*What principles would guide you in framing a rotation of crops for your district? Would it be possible profitably to include a legume and a root crop?*

*What crops can be combined with paspalum pastures in your district to maintain the supply of green feed throughout the year?*

*How far do you think it is true that a good bull can build up his owner's fortunes, and a poor one can ruin them? Have you considered what it would mean to you to breed heifers that will yield* 50 *lb. more butter per year than their dams?*

*Have you ever tried the application of fertilisers as a top-dressing to the growing maize crop at any stage during growth?*

## REPORTS AND NOTICES FROM BRANCHES.

***NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.***

### Auburn.

The usual monthly meeting was held on 9th October, thirty members being present.

A paper was read by one of the members on fertilisers, and how to use them, and an interesting discussion followed.

### Bimbaya.

Another meeting was held on 25th September, when there was a good attendance. A letter was read from the Candelo Agricultural Association, asking for co-operation in several matters connected with the Dairies Supervision Act. Eventually it was decided to hand over the letter to the Bimbaya branch of the Primary Producers' Union.

It was decided to apply to the Department of Agriculture for a collection of bacteriological specimens.

A lecture was given by Mr. J. Heffernan on his recent trip to Great Britain, and much enjoyed.

On 7th October a lecture was given by Mr. L. T. MacInnes, Dairy Expert, on the value of herd-testing.

At a meeting on 26th October articles on the curing of lucerne hay and conservation of fodder were read. Plans for the construction of silos were exhibited by Mr. E. T. Boller.

In a lengthy discussion that followed, several members favoured the construction of silos, pointing out that the district was well adapted for it, having any quantity of sand, &c., for the purpose. Others considered the silo too expensive for the small farmer.

It was contended that the growing of oats for hay was no longer profitable, owing to the depredations of rats and mice; it was stated, however, that providing the barn had a good hardwood floor, and the hay was tightly pressed, very little damage would result. Several members spoke in favour of bush hay, which, if made when the grass was just out in head, made good fodder for stock.

Others contended that the paddocks were not well enough cleared for this purpose, and many breakages of mowing machines would occur. Maize stalks, chaffed and mixed with molasses and bran, found favour with some. Sorghum, Sudan grass, lucerne, &c., were also spoken of favourably.

### Borenore.

On 19th October, Mr. A. E. Shierlaw, Assistant Sheep and Wool Expert, gave a lecture and practical demonstration at Borenore. The attendance was good and much interest was evinced in the subject, the desire being expressed that Mr. Shierlaw should repeat his visit.

The subject of the lecture was the cross-breeding of sheep, the suitability of the crossbred for the farm and the manner in which wheat-growing and sheep-raising could be combined being dwelt upon. The conditions most suitable for the Merino and for the British breeds were pointed out, and also the type of sheep that could be most profitably used for cross-breeding. The necessity for using pure-bred rams of the British breeds and large-framed, plain-bodied Merino ewes was pointed out.

The types of wool produced from the various crosses were also touched upon, and the results of the Department's experiments indicated.

The methods of breeding for wool were dealt with first and then for the raising of mutton and fat lamb.

After the lecture, the sheep yards of Mr. J. Carr's farm were visited, and the different qualities of wool grown on the different parts of the sheep pointed out. Certain types of ewes that could not be mated with the British rams were indicated. For the raising of both wool and mutton, the Border Leicester ram was recommended for most conditions.

On 22nd October a moving picture demonstration was given for members, and more especially for their children. About sixty people were present, and an enjoyable musical programme was also given. The pictures included industrial subjects such as herring fishing, mussel fishing, iron works, &c.

At a meeting of sixteen members on 23rd October a useful general discussion took place on diseases of horses and treatment therefor.

### Castlereagh.

On 29th October, Principal H. W. Potts, of Hawkesbury Agricultural College, delivered a lecture on the cow and her milk, forty-two members being present.

The lecture and the subsequent discussion were directed to the breed, type, feed, and treatment of the cow and calf to produce the most profitable results in supplying milk to a concentrated milk factory. All local conditions and points of practical value were dealt with and discussed. The members were keenly interested.

The lecturer subsequently distributed a quantity of bulletins, leaflets, &c., of local interest.

### Clifton (near Young).

Mr. E. Breakwell, Agrostologist, visited this district on 27th October and delivered a lecture on noxious weeds, in which he gave valuable information on their control. He felt sure that providing thorough working of the soil was continued and other methods were adopted, the troubles with weeds would be greatly minimised. He strongly recommended the growing in the orchard of smothering crops such as barley, field peas, rape, &c., which would also enrich the soil and help to conserve moisture. Side crops treated with artificial manures would also be found a factor in control. Subsequently several orchards were visited, and various weeds were pointed out, and useful information given about each.

The visit was greatly appreciated by members, the more so as it was the first of the kind they had had.

### Coraki.

At this branch on 19th October, matters in connection with the exhibit at the next Coraki show were advanced; seeds for the purpose have been secured and distributed to members.

Details were also arranged for a maize-growing competition among members, and it was agreed to ask the Department to allow one of its officers to prepare a scale of points and to judge the competition.

Owing to the good results obtained from Para and Guinea grasses at Wollongbar Experiment Farm, orders have been placed for considerable parcels of plants for distribution.

### Cunningham.

A meeting was held on 29th October, when a paper on firebreaks was read by Mr. B. J. Stocks.

Mr. Stocks urged that the luxuriant growth of grass and herbage would be likely to spread fire rapidly in all directions if there was an outbreak. He recommended that groups should be formed with a leader to each, who should arrange for a signal at which all in each group should mobilise at the point where the fire existed. Firebreaks were of importance; they should be about a chain wide, and if possible sown down with summer fodder or lucerne. It was a good plan to burn a break back from a firebreak, so as to meet the oncoming fire and to make doubly sure. Firebreaks were generally most necessary on the western and north-western sides of the farm, those being the directions of the prevailing winds. Fallow land made an excellent firebreak, and with closer subdivision and more fallowing the danger would be much reduced. Finally, the water cart should be kept ready for action at a moment's notice, for a water cart well handled was equal to several men's labour in suppressing a fire.

### Inverell.

The monthly meeting was held on 27th October, Mr. J. Ditzell presiding. The branch's request for information about the oat mite (*Notophallus bicolor*) was answered by the Department with an intimation that it had done considerable damage in the Delungra district, but there was not much chance of effective remedy in a large area; as long as it remained on the flag the crop might recover.

The Tingha branch asked for co-operation in calling a conference of branches at Inverell as early as convenient. It was pointed out that Inverell was the natural centre for the district, and that such a conference would enable the members of the Bureau to take united action, and would tend to strengthen the spirit of co-operation.

The Inverell branch agreed to co-operate in the matter, and it was suggested that the conference might be held in the middle of January.

Correspondence on the subject of evidence before the select committee of the Legislative Council was received with satisfaction, members considering that valuable material could be collected in such a way: a discussion took place as to the character of the information that might be tendered.

### Kellyville.

At a well-attended meeting on 6th November a discussion took place on growing maize for green feed. It was agreed that broadcasting, with about 3 cwt. of blood and bone per acre was best.

During the evening a presentation of a case of pipes was made to Mr. H. Firth, in acknowledgment of his untiring services to the branch.

### Lidcombe.

At a meeting on 1st November, over fifty members and residents were present. There was a good show of roses, prizes being given for the champion, the best six, and the best six of one variety from bud to full bloom, as well as a good display of flowers in the usual monthly competition.

Mr. A. E. J. Anderson gave a lecture on the effects of light and colour on plants, explaining how necessary it was to know what colours to cross to get a certain result by cross-fertilisation. How colour affects the germination of seed was also explained. If a frame with blue glass or a blue material were made, and put at an angle of about 45 degrees facing the morning sun, the seed would germinate in two-thirds of the time necessary in the ordinary way. The frame should be removed as soon as the plants showed above the soil. Good results could also be obtained with cuttings treated in the same way.

This branch makes it a practice to devote one meeting to flowers and the next to vegetables, and some good exhibits are staged each evening. Three tables, making in all 21 feet x 2 feet 6 inches, are well covered each evening, which speaks well for the progress of the branch. A garden competition is being conducted that is having quite an influence on the appearance of the district.

### Matcham.

This branch met on 23rd October, when the following officers were elected for the ensuing year:—Chairman, Mr. C. Cox; Vice-chairmen, Messrs. H. Mills and W. Crossland; Treasurer, Mr. A. Macinante; Librarian, Mr. W. Crossland; Hon. Secretary, Mr. J. Dodd.

The balance-sheet showed a credit of £9 10s. 7d., the financial membership being forty-two.

### Milbrulong.

The annual meeting of this branch was held on 25th October, with a large attendance. The following office-bearers were elected:—Chairman, Mr. J. T. Lynch; Vice-chairmen, Messrs. O. Slickler and W. Mackaway; Hon. Secretary and Treasurer, Mr. J. M. Gollasch. The annual report showed that the branch had last year a membership of 154, and that twelve meetings had been held, at which the attendance averaged thirty. Several experts from the Department of Agriculture had visited the district during the year giving demonstrations and lectures. An exhibit was staged by the branch at the Lockhart show, and formed one of the features of the industrial hall, being a credit to members and a demonstration of the capabilities of the district.

A social gathering was held on 3rd November at Mr. H. Belling's farm, where the experiment plots for the district are located. Over a hundred people were present, and accompanied Mr. G. C. Sparks, Inspector of Agriculture, round the plots, after which, having paid sixpence for a piece of paper for the purpose, each one proceeded to estimate the yields per acre of the different varieties. The best estimate will receive a prize of £2, and the second best £1.

The ladies then entertained those present at afternoon tea. The function was so much enjoyed that a similar event is forecasted for next year.

### The Co-operative Movement at Milbrulong.

In response to the invitation of the Department, the secretary, Mr. J. M. Gollasch, has furnished a statement concerning the co-operative movement among members of this branch.

The movement commenced in March of this year with the following objects:—

1. To obtain farmers' requirements at the lowest possible cost.
2. To bulk purchases in order to obtain the lowest railway freights.
3. To eliminate middlemen and agents as far as possible.
4. To bring farmers into touch with the markets for farm produce and farm requirements.

The first move was a special meeting at which the venture was discussed, a committee of seven was appointed to control the business, and the secretary was instructed to write to various wholesale houses for quotations for farm requirements. A date was then fixed for the first meeting, at which orders would be taken.

At the "order meeting" the quotations received were read by the secretary, the members present making a note of their requirements. Each then signed his list and handed it to the secretary, who then made up the total orders into one large order and despatched it to the firm quoting most reasonably.

To enable cash to be paid for the goods upon receipt of invoice, all members signed a guarantee for an advance of £1,000 from the bank. This proved very successful, as during the first six months of operations the interest on the amounts borrowed amounted to only 14s. 1d., while the discounts received in consequence of paying cash within the three, seven, or thirty days, as the case might be, amounted to £12 10s. 4d.

To the cash price and freight on the goods a handling charge of 2½ per cent. was added, of which 1½ per cent. was paid to a man who was appointed to take delivery of the goods on arrival and to distribute them to members as ordered. The remaining 1 per cent. was retained to cover banking and secretarial expenses. After six months of operations it has been found that the 2½ per cent. is sufficient to cover all expenses.

All members have to pay cash for goods on delivery; this is necessary to safeguard the venture from bad debts, &c.

One rule provides that only *bona-fide* farmers can be appointed on the committee, in order that agents may be prevented from getting in.

During the first six months the following lines were handled successfully:— Oils, binder twine, seaming twine, cornsacks, wire, benzine, kerosene, groceries, and other smaller farm requirements. On an average about 20 per cent. was saved over local prices—in some cases as much as 60 per cent. Some farmers have bought up to £150 worth of goods in the six months, and the saving to them has been substantial.

The turnover for the first six months, during which three "order meetings" were held, was £1,587 16s. 6d. An order meeting, which was held on 22nd October for harvest supplies, resulted in an order for approximately £800 worth of goods being handed to the secretary, about £200 of which was for groceries.

The movement has met with such marked success that people have come 15 to 20 miles to place an order for goods. The members of the branch have now decided to commence a farmers' co-operative store in the new year, and promises of 3,000 shares at £1 each have been received, which means that co-operation is a long-felt want of the primary producer.

Two other branches of the Bureau are inquiring from Milbrulong the nature of the co-operative movement, with a view to following suit.

## Miranda.

The secretary of this branch furnishes particulars of the Miranda Agricultural Bureau, Limited, as in the following paragraphs:—

### The Co-operative Movement at Miranda.

The Miranda Agricultural Bureau, Limited, was established three years ago for the purpose of acquiring a meeting place for the branch and to obtain supplies for poultry-farmers and others. It is only a trading company, being distinct from the branch of the bureau, though run in conjunction with it.

It was started in a humble way, without any very great pretensions, the officers and directors carrying out the work free of expense, and thus conserving everything for the benefit of the company. A building that had been used as a church was purchased, and opened by Mr. W. C. Grahame, then Minister for Agriculture. Shares at £1 each were issued, either fully paid up or being paid up at 2s. 6d. per month. We then started buying a truck of wheat from the Wheat Pool, and engaged a carter by contract to deliver it to the members. This turned out a great success. We started on a basis of 5 per cent. addition to cover expenses and to help build up the company. Some members who only took up one share and bought seven bags of wheat stated at the next meeting that they had saved their £1 already.

We soon had to extend our operations, as bran and pollard, kerosene, and other articles were wanted. This system worked well for a start, but it was soon found that a stock in hand was required, so a store that was available was rented and a storeman engaged, as the business was getting too large for voluntary labour. From this point the growth of the company was rapid, and at the end of the first year we were able to pay a dividend on shares of 7½ per cent., and a bonus of 1s. in the £ on purchases. This put us on a good footing.

Our great success has been in being able to supply bran and pollard in times of scarcity; in trying to cater for the poultry-farmer we looked ahead for supplies, and this saved the industry. We now supply all the needs of poultry-farmers and orchardists, including manure, lime, sprays, flour, sugar, coal and coke; and anything else required is obtained for them.

One great result has been the reduction of prices for miles around; in fact, we have abolished the profiteer. Our turnover is now nearly £3,000 per month. Our capital now amounts to £1,300, of which amount over £500 is accrued bonuses, so that members have only actually paid in £800, though holding £1,300 worth of scrip carrying 7½ per cent.

Lately we built a store of our own adjoining the railway siding, at a cost of £350, which was all paid for out of last half-year's profits. We now own real estate to the value of over £800, all paid for. Instead of voluntary labour, we now pay a managing director and a storeman.

This shows what can be done by co-operation on right lines and by good management. It was not accomplished without opposition, but we went on steadily, gave everyone a fair deal, pursuing a straight policy, and to-day we can hold our own without anyone troubling us.

## Penrose-Kareela.

At a meeting on 5th October a paper was read by Mr. R. G. Scott, and its text will be found in the following paragraphs:—

### The Functions and Requirements of an Apple Tree.

Let us imagine it possible for an apple-tree to be endowed with the power of speech, and that it wishes to place before us orchardists a few facts connected with its daily life. It would say something like this:—

I may not have a mind, and I certainly have no brains, heart, or lungs, but for all that I claim to be considered as a producer of beautiful blossoms and useful fruit. There are four functions I perform in common with human beings—I drink, I eat, I breathe, and I sleep.

*I can drink.*—My drinking powers are enormous. When I grow into a large tree I require daily an astonishing volume of water from the soil, which I

obtain by means of tiny hairs attached to my roots. These hairs are exceedingly delicate, and of short duration; as my roots increase in length new ones are formed and the old ones die. I form a great number of these hairs if the soil is kept in good tilth and heart, and they provide me with an immense absorbent surface, whereby I may appease my thirst.

If you were to cut me down in spring you would discover to some extent the amount of sap that is circulating in my system through the outer woody tissues of my stem inside the bark. To use a human expression—I would bleed to death. About 60 per cent. of me is water.

I am not a lover of pure distilled water, but like some human beings, I prefer something stronger. What benefits me is water with a weak "salt" flavouring. I do not mean common salt. There are many kinds of "salts" that delight me.

If you see me pale and languid, give me nitrate of soda or sulphate of ammonia, the former for preference, if the soil be acid, deficient in lime and not too clayey; it also encourages me to root deeper. Then see how my leaves will expand and change to a deep green to thank you.

If, however, you find me growing too fast, steady me down with phosphates, bonedust, basic slag, or superphosphate, applied in spring according to individual soil requirements.

Potash "salts" also delight me; they make my leaves thicker, so that they can work harder. They also make me more resistant to disease; and last, but not least, put colour in the fruits I produce, and enable me to give them finish and flavour. Sulphate or muriate of potash is good if applied at "pinking stage" or later when fruit has set.

Another thing that is most essential to my well-being is lime in its different forms. If the soil is stiff and clayey, or if it is acid from a large accumulation of humus, give me burnt lime; if it is light and of a sandy nature I prefer the carbonate. Sour soils I abhor; my feeding roots will not respond to them. Lime keeps me fresh and sweet and induces me to form a fruitful tree, provided a sufficient supply of humus is present and, of course, water, because I do not eat through my roots—I only drink.

How do I drink? How can I drink? By the process of "osmosis;" in other words, the diffusion that takes place from a weaker solution into a more concentrated solution when separated by a membrane—in this case the cell-walls of my root-hairs.

*I can eat*, or rather take food into my system. I eat, or, in other words, obtain the substance for my solid structure from the air, and this comes to me in the form of invisible gas—carbonic acid gas. Nature has placed in the under side of my leaves minute mouths called stomata, through which the gas gains an entrance. Leaves are really factories, making from the air and the "salt" solution which comes from my roots during sunlight particles of solid matter, and these are used in building up new growth. Wonderful factories driven by the power of sunlight!

It is again due to the action of sunlight, combined with "osmotic pressure," that the sap ascends from my roots enabling me to make good the loss from evaporation.

My leaves are everything to me. Take heed of this when summer pruning, and use the knife at the right season and with care. I may mention that the factory closes at sunset and opens at sunrise; the leaves rest from eating when the sun goes down.

*I can breathe.*—I want oxygen quite as much as any human being, night and day. Again my leaves are vital to my existence, the air supplies the oxygen, whereby I keep fresh and live. I breathe also through my roots, so how can I exist if the soil is hard and cement-like or water-logged? I breathe also through my stem. I prefer to breathe a cool temperate climate with a bracing altitude; cool nights and bright sunny days in summer enable me to bring to perfection my crop of fruit, and frosts in autumn and winter induce a period of rest from my labours.

*I can sleep.*—I get tired of life each autumn, my leaves drop off, and I lead a sleepy and passive existence till spring-time, when once more the factory is opened.

Treat me more like a human being, and give me water to drink, with something in it to flavour it, of course—none of your pure distilled water—I want

mineral salts in solution. Don't excite me with nitrogenous foods in autumn, or keep me awake when I want to rest. Just keep me fairly dry—my roots hate a wet bed—and let me rest awhile.

I'll waken up all right in the spring, fresher than ever, with my blossoms and fruits to please you.

The monthly meeting was held on 1st November, when a discussion took place on the carriage by the railway of empty new and second-hand cases, and it was decided to communicate with the Railway Commissioners in the matter.

## Rydal.

This is a newly-formed branch, taking in a widely scattered area in the Bathurst district. Mr. C. McAlister has been appointed hon. secretary, and he is displaying much interest in the work.

On 15th October a lecture was given by Mr. W. le G. Brereton, Assistant Fruit Expert, on spraying fruit trees for diseases and insect pests. There was an attendance of seventeen members representing a radius of about 12 miles.

Mr. Brereton dealt with various insect pests and diseases, including codlin moth, fruit fly, aphis, San José scale, mussel scale, black spot, mildew, &c., and detailed the preventive and remedial treatments in each case.

Incidentally, interesting descriptions were given of the experimental work carried on at Bathurst, Glen Innes, &c.

At the conclusion of his address, Mr. Brereton answered a number of questions concerning pruning and spraying.

A further meeting was held on 22nd October, when Mr. F. B. Hinton lectured on the types of sheep suitable for the district.

Mr. Hinton pointed out that such factors as situation, area, and the particular aim of the sheep-owner (production of wool, or wool and mutton or of early lambs) would all have to be considered in the selection of a suitable type of sheep.

For wool-growing the Merino of fine to superfine type was most suitable. The best dual purpose sheep was obtained by crossing English longwool breeds, such as Lincoln, Border Leicester or Romney Marsh with Merino ewes. In districts where conditions favoured foot-rot, fluke and such troubles the Romney Marsh was best, as it was practically immune from foot-rot and would withstand disease better. In sounder country the Border Leicester should have preference. It was pointed out that this locality was not generally suitable for early lamb-raising. The requirements of the trade being carcases of from 30 lb. to 40 lb. at from 16 weeks to 20 weeks of age, the very best pastures were necessary to enable the ewes to supply adequate nourishment. Proximity to market and trucking yards were also important considerations, as it was found that lambs in transit lost up to 7 per cent. of their weight.

Incidentally the lecturer made reference to the experiments at Bathurst and other farms.

At the conclusion a number of questions were answered concerning the symptoms and treatment of ailments, and the characteristics of various breeds.

## Stony Point (via Leeton).

At a meeting on 9th October, Mr. C. A. McCormack read a paper relating his experience with sheep on an irrigation block.

### Some Practical Experience with Sheep.

My object in taking on sheep for a living on an irrigation block was that having tried contract work and not being able to get a profitable return for my labour and labour employed, I took it that the sheep would not take all my attention and that I would not have to employ any or very little labour at all.

I cannot give exact figures, but in a rough way I consider that I have gained enough experience in keeping breeding ewes to make all the difference between success and failure. In my first year I had 217 two-tooth second and third cross Lincoln Merino ewes. This flock was mated with Lincoln rams, and until after they lambed they had fair feed and were in good condition. Out of the 217 ewes I marked only 140 lambs. The ewes were watched carefully and only two ewes had any assistance, and no ewes died; as far as I know every ewe had a lamb, but in some cases the ewes were in trouble half a day or more before the lamb was born, the lambs being fat and large—in fact, they appeared to me to be a deal larger when born than when two days' old. Several were born dead, and the balance died when a day or two old.

Seeing a farmer who had a dry area close by with lambs that seemed a long way more robust and larger than mine, and finding that he had had very few deaths and had marked 100 per cent. on grass feed in the good years, I inquired and found that he had used Border Leicester rams. After taking stock of other settlers with Lincoln cross lambs and comparing them with the dry area Border Leicester lambs, it seemed to me, other things being equal, that this was the best class of ram for lamb-raising.

This year (1920) I mated 130 four, six, and eight-tooth crossbred ewes with Border Leicester rams, and also bought 100 more ewes that were in lamb to Lincoln rams. These ewes lambed at the same time as the original ewes, and although I could not keep them separate I know that the ewes that had Lincoln cross lambs had a long way more trouble lambing, and in several cases had to be assisted, whereas in not one case did the ewes with Border Leicester cross lambs require any assistance, and, on the contrary, seemed to labour very little at all when lambing. Only three Border Leicester lambs died at birth or after, while several of the Lincolns died at different times.

The Border Leicester lambs without exception seemed a skinny lot and not much to look at, but after a few days they started to fill out, and so far have not looked back. Out of the 240 ewes 200 lambs are alive, with a few to come yet, and I am confident that if all the ewes had been mated with Border Leicesters I could have kept considerably more lambs alive and had a better percentage. The ewes mated with Border Leicester rams had twins in several cases and reared them, but not in a single instance did the ewes mated with Lincoln-cross rams have twins.

As these ewes were yarded every day and night, I had every chance of seeing how they fared. The flock was grazed for half an hour to one hour on lucerne and green oats twice each day, and kept condition well, no deaths occurring, and as each ewe lambed she was turned out on green wheat, oats, and barley, doing well there until the rain came and gave feed on the dry areas.

One great point that has struck me is the saving of feed that can be effected on a small area of lucerne or other green stuff by letting the ewes (provided they are in fair condition and sound mouthed) have only their fill morning and night, and yarding them the rest of the time. If, on the other hand, they were allowed to run all the time on the same feed it would not last a fourth of the time. This, of course, applies to ewes in lamb; once the lambs are dropped the ewes must have good feed, and as much of it is they can eat, or there will be trouble.

Now, I would like to say a few words about foxes. The first few lambs that were born were healthy and strong, but each morning one at least had been killed, and only the tongue taken out by a fox. I laid baits in the latest known way, but the fox did not touch them, though he still killed the lambs. Then I read that a farmer had been successful in preventing these losses by tying a strip of tin round the lambs' necks. I tried it on all the lambs that were then alive, and on the first night the fox took the bait, and so ended his career. I have continued putting the tins on each lamb, night and morning, as they are dropped, and to my knowledge not one lamb has been killed since by foxes.

It is understood that a fox always upsets a lamb first and then catches him by the throat, but with the tin collar on, the fox cannot bite the lamb's throat in time to stop it from bleating; as soon as the lamb attracts attention by bleating the fox becomes frightened and gives it up, and proceeds to another flock that has no protection.

The tin shield is made to go over the back of the neck and fit well down each side, and has holes at each end through which the ties are passed by which the tins are kept in place.

At a meeting held on 30th October, the above paper was discussed at some length. It was pointed out that on Mr. McCormack's figures, maiden ewes joined with Lincoln rams gave an increase of 64½ per cent., while the same ewes mated the next year with Border Leicester rams gave an increase of 92 per cent. Mr. J. Smith contended that the return in the first case was highly satisfactory for maiden ewes and on a par with the results of the next year. Mr. McCormack agreed that the Lincoln-Merino ewes were of fine type and might have influenced the progeny quite as much as the Border Leicester rams in giving the increase of 92 per cent. It was ascertained that the ewes mated with Lincoln rams in the second year had had a very severe time prior to coming into Mr. McCormack's possession.

Members expressed gratitude to Mr. McCormack for his contribution, which was regarded as presenting valuable experience.

### Stratford.

At a meeting held on 23rd October, Mr. Mitchell, of Gloucester, outlined a scheme for the formation of a herd-testing association in the district. It was unanimously agreed to try to introduce the herd testing movement at Stratford, and canvassers were appointed to interview local dairymen.

It is anticipated that the dairy farmers of the district will very soon be able to participate in the advantages to be derived by having the yields of their cows systematically tested and recorded, with a view to the unprofitable cattle being culled out.

### Wellington.

Instead of the usual monthly meeting in October, this branch conducted a flower show on the 19th of the month, which proved a great success. It was agreed that such a fine collection of garden flowers, more especially of roses, has never before been seen in Wellington, and the success of the fixture fully justified the branch in having taken so much interest in horticulture. The show was opened by Mr. A. J. L. Stockwell, President of the Agricultural Society, who warmly congratulated members of the Bureau upon the excellence of the blooms staged.

### Wentworthville.

A meeting of this branch was held on 27th October when a lecture was given by Mr. J. Hadlington on fowl tick and other poultry diseases. The attendance was good and the attention to the lecture and the questions asked afterwards were evidence of the interest in the subject, and the usefulness of the advice given.

The spring show of the branch was held on 30th October, and was a great success, some well known horticulturists in the metropolitan area competing. The show was opened by Mr. W. T. Ely, M.L.A., who congratulated the branch on the fine show of blooms and vegetables. The entries were very numerous, and the prizes a handsome lot.

### Windsor.

A meeting was held on 19th October, when it was agreed to hold an exhibition at Windsor prior to the Hawkesbury District Show.

Arrangements were also made for two gentlemen to represent the district before the select committee on agriculture.

A lecture was delivered by Mr. E. Breakwell, Agrostologist, on 25th October.

The old introduced grasses were first discussed, including perennial ryegrass, cocksfoot, and red clover. Perennial ryegrass produced excellent feed for a short period, but continued dry and hot weather was very adverse to it, and it was usually found that cocksfoot lasted much longer. Unfortunately cocksfoot became very harsh and tussocky unless protected by other grasses or clovers, and as perennial red clover did not, as a rule, last too long in such a district as Windsor, the Department had experimented with other grasses and clovers that would last with the cocksfoot. Splendid results had been achieved in this connection with Bokhara clover and *Phalaris bulbosa,* and the attention of farmers in the Windsor district was particularly drawn to these. *Phalaris bulbosa* was a grass that was doing remarkably well in winter months; as a good winter grass was urgently required it was hoped that *Phalaris bulbosa* would fill a long-felt want.

Among the summer grasses, Sudan grass, Rhodes grass, *Paspalum dilatatum,* Kikuyu, and Elephant grass were dealt with. Paspalum soon became sod-bound in Windsor district, and it was questionable whether Rhodes would not give better results. A mixture of Rhodes grass and lucerne had given splendid results. Many farmers, however, preferred couch to anything else on the rich flats, and there was a lot in this argument as far as summer feed was concerned. It absolutely failed in the winter and early spring however, and for this reason some farmers were against it. Sudan grass, of course, was well known, but it might be added that very promising results had been obtained by growing it as a pasture grass rather than for hay. It stooled well under feeding-off, and gave feed well into the winter.

Elephant grass had the following points to recommend it:—(1) Drought resistance, and (2) rapid growth and big yields. No other grass could produce the same amount of feed per acre as this. Kikuyu grass was recommended as a fine succulent grass, and cuttings were promised to any member desirous of obtaining them. Shearman's clover could also be strongly recommended for low-lying lands.

The native grasses suitable for Windsor were also described. Coolah grass had given splendid results at the College; so had rare blue grass, love grass, and Warrego summer grass. Unfortunately we had practically no good winter native grass, and recourse to the introduced grasses for this purpose was necessary.

The lecturer pointed out that the Department was very desirous to have the co-operation of the farmers in the work under discussion.

### Yarrunga-Avoca.

On 25th September a discussion took place at a meeting of this branch on the cost of producing and marketing cabbage. The crop discussed was winter cabbage grown on red volcanic soil that had been previously cleared and fenced. It was worked out that (without those items) it would cost £59 18s. to grow and market an acre of cabbage. The preparation of the soil was as follows:—Ploughed and left under fallow; harrowed, ploughed and harrowed again; crop ploughed in, blood and bone being shaken by hand at 15 cwt. per acre; when the plants were big enough they were scarified twice and chipped with the hoe once. When the crop was ready, it had to be carted ten miles at a cost of £1 per ton, horse feed being very dear.

At a subsequent meeting arrangements were made for the annual picnic of the branch.

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CRAYFISH do little harm on the farm except where they get into dams and canals, when they tunnel holes through the earthworks and may do a considerable amount of damage.—W. W. FROGGATT.

# AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agri culture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

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